RAILROAD GAZETTE

FRIDAY, SEPTEMBER 13, 1901.

CONTENTS

Contributions

Tractive Power of Locomotives.

New York, Aug. 21, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I have read with much interest Prof. Goss' article on "Tractive Power of Locomotives," and your editorial comments thereon in your issue of Aug. 16, and desire to call your attention to some erroneous conclusions which I think have been reached by attempting to compute exact formulas from a testing plant, rather than from actual practice on the road. I would also call attention to the danger of considering the conclusions so reached as absolute and final.

In the first place it is well known that a locomotive boiler placed in a stationary plant will only give about a third of the capacity of the same boiler on a locomotive running at high speed on a railway track. This is due to the fact that the constant jar of the engine on the rails keeps the water in solid contact with the heating surfaces and the bulbs of steam are more freely liberated, while the stationary boiler will begin to prime at about one-third the rate of evaporation under the other conditions. Therefore, a locomotive at the testing plant is under somewhat similar conditions to a stationary boiler.

Prof. Goss gives 1 h.p. for each 2.5 sq. ft. of heating surface as the maximum capacity of his locomotive. We have authentic records of a locomotive giving continuously 1 h.p. for every 1.02 sq. ft. of heating surface in the boiler. Another point has been ignored in arriving at this arbitrary standard of 2½ sq. ft. per h.p., and that is the grate area. If the boiler under discussion had been provided with double the grate area and a larger direct heating surface it undoubtedly would have shown different and much superior results.

As a practical illustration I recall an instance that has come under my observation where a locomotive having about the same heating surface as the Purdue engine, pulled a train of 200 tons, exclusive of engine and tender, for a considerable distance on a level at a speed of 90 miles an hour. Now, if we allowed 12½ lbs. to be the amount necessary to do this, we have 2,500 lbs. drawbar pull behind the tender, whereas the Purdue engine, under the conditions outlined by Prof. Goss, would have none, or zero. Another instance, with this same engine: A train of 16 cars, seven of which were parlor cars, weighing, exclusive of engine and tender, 490 tons, was pulled at a speed of 60 miles an hour on a level. This, allowing 12½ lbs. per ton would give 6,125 lbs. drawbar pull, when the Purdue engine, according to Prof. Goss, would give only 2,000 lbs. drawbar pull.

Another instance with a different locomotive, of somewhat greater power, and an illustration, that by reason of the work being on a grade, when a large proportion of the power of the locomotive was consumed in lifting the train to a higher level, which work can always be figured a definite quantity and not subject to any question or debate, as is the question of train resistance at different speeds. This was run with a 10-car train up a grade of 53 ft. to the mile, 16 miles in 20 minutes, or at a speed of 48 miles an hour. The train, without the engine, weighed 340 tons, as it consisted of four Pullmans and six coaches and mail cars. The lift of the train, without considering train resistance, required 877 h.p. Train resistance, including engine and tender, represented 540 h.p. The lift of the locomotive and tender required 256 h.p. This gives a total of 1,673 h.p., the use for which was actually accounted for, while the locomotive was developing something over 1,800 h.p., as she was using water at the rate of 48,000 lbs. per hour, which, allowing 26 lbs. per h.p. per hour, would give 1,846 h.p. Allowing this figure we have 173 h.p. as the friction of the locomotive, while Prof. Goss allows 400 lbs. drawbar pull, or its equivalent, as the friction of his locomotive at all speeds. If we assume a speed of 60 miles an hour this would represent 64 h.p., or about 10 per cent. of the power of his locomotive, while the 173 h.p. is 9 per cent. of the power of the locomotive above referred to.

We might give many more instances but deem this sufficient to demonstrate the fallacy of the conclusions arrived at by Prof. Goss for the reasons outlined above.

GEO. S. STRONG.

LaFayette, Ind., Sept. 7, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read Mr. Strong's criticism of my contribution to the Proceedings of the Master Mechanics' Association, and venture to submit the following rejoinder.

It is doubtless evident to all who heard my discussion at Saratoga, or who have read your report of it (*Railroad Gazette*, Aug. 16), that my purpose was to give, in brief form, a general view of the nature and extent of those losses in tractive force which occur when the speed of a locomotive is increased. To accomplish this purpose general facts only could be employed. The source from which these were derived and the foundation for such assumptions as were necessary to connect them, could not be made subjects for extended discussion. I realize that for many who have not had occasion to follow the development of the subject, the fundamental statements underlying my discussion must be accepted or rejected on the strength of my having made them. Of course, I do not expect every one to accept them and I should find no fault with Mr. Strong if he were content with simply calling them in question. But Mr. Strong, while refusing to accept the results of my work, is free in advancing statements of his own in an attempt to disprove them; these impress me as quite as heretical as mine have doubtless appeared to him.

First of all, I am constrained to challenge his statement that "It is well known that a locomotive boiler placed in a stationary plant will only give about a third of the capacity of the same boiler on locomotives running at high speed on a railroad track," and his conclusion that the boiler of an actual locomotive on a testing plant cannot be made to deliver as much power as could be obtained from the same boiler on the road. My reasons for doubting this conclusion are as follows: It is often assumed that the boiler of a locomotive which is being operated upon a testing plant is at rest, but it is, in fact, subject to severe vibrations. The motion of the machinery, and especially the thrust of the connecting rods, subject the engine to severe tremors and cause it to rock from side to side. The boiler of a locomotive on a testing plant, therefore, should not be considered a stationary boiler.

Again, even if it be assumed that the boiler of a locomotive on a testing plant is at rest, it still does not appear that Mr. Strong's conclusion holds. If, in two boilers of identical dimensions, one being stationary and the other mounted on a movable locomotive, a given rate of combustion is maintained, there must of necessity be the same amount of heat liberated in each case. In each case, also, all of the heat liberated must either be absorbed in passing the heating surface or must pass out from the stack. If a like amount of heat is absorbed by the heating surface of each boiler both will develop the same power. If the amount of heat absorbed by the heating surface of the two boilers is not the same the temperature of the smoke-box gases for the two boilers will be different. It must be admitted that experimental data, showing smoke-box temperatures is not abundant, and I cannot now give references, but I distinctly remember that an examination of all the facts that I could find a few years ago led to the conclusion that the smoke-box temperature of stationary boilers is not higher than that of a moving boiler, when the boilers are the same and are under like conditions of combustion, thus proving conclusively that the motion of a boiler does not contribute to its power.

Another reason for doubting the accuracy of the statement is to be found in the fact that tests upon a locomotive boiler at rest and upon the same boiler under the active vibration of a testing plant reveal no differences in power or efficiency. Finally, I must add that while I have often seen statements in print similar to that of Mr. Strong, I have never seen the slightest evidence to sustain them.

Mr. Strong is in error when he credits me with giving "one horse power for each 2.5 sq. ft. of heating surface as the *maximum capacity*" of a locomotive. I make no such statement. Tests have, in fact, been made upon the Purdue testing plant involving power slightly higher than this, but in all such cases the conditions have been deemed exceptional. While there are many engines which frequently deliver, for short intervals of time, more than one horse power for each 2.5 feet of heating surface, there are others which seldom reach this limit. My belief is that the value I have chosen is practically a maximum for sustained work, as disclosed by service conditions upon the road, but in common with all general statements it may fail in some specific case. It is not proposed as a measure of what locomotives can do, but of what they are doing.

Mr. Strong's assertion to the effect that he has authentic records to show that a locomotive may give continuously a horse power for each 1.02 sq. ft. of heating surface does not affect my confidence in the values I have employed. Either the locomotive to which he refers gave a marvelously high performance or it was worked under conditions which were exceptional or the methods employed in securing the data were misleading. I do not think that those who have been concerned with the design of recent heavy engines would feel at all justified in reasoning from Mr. Strong's statement to the conclusion that they have locomotives in service which are developing as much as 3,000 horse power, and yet if Mr. Strong's statement has any significance in the present discussion, this is just what he would have them do.

Mr. Strong objects to my basing an estimate of power upon the heating surface alone, and calls attention to the fact that the grate as well as the heating surface appears as a factor. I admit the force of this criticism, but it is less than would at first appear, since changes in grate area affect the efficiency of the boiler much more than its power.

Referring to the results of tests quoted by Mr. Strong, I question whether many beside himself have ever seen an engine the size of the Purdue engine (17 x 24 in. cylinders 85,000 lbs. weight) pulling unaided on a level track a train of 200 tons, exclusive of engine and tender, at a constant speed of 90 miles an hour. His figures also show that this same engine at a speed of 60 miles an hour exerts 6,125 pounds draw-bar pull, which is equivalent to 980 horse power alleged to have been delivered at the draw-bar—an amount of power which is nearly double that disclosed by any tests of so small an engine which which I am familiar.

I am pleased to find in the last paragraph of Mr. Strong's communication conclusions with reference to engine friction tending to confirm values which I have assigned.

I should add that I hope soon to present for discussion a detailed exhibit concerning the basis of the several assumptions which underlie the statements to which attention has been called. This, when it appears, will present a fairer mark to Mr. Strong, and I hope that he will not allow the opportunity to pass unimproved.

W. F. M. GOSS.

Lap Sidings On the Cleveland & Pittsburgh.

BY L. F. LOREE.

[In 1890 Mr. Loree, who was at that time Superintendent of the Cleveland & Pittsburgh Division of the Pennsylvania Company, wrote for us an article describing the development and use of lap sidings on that Division. This was published in our issue of Dec. 26. That impression of the *Railroad Gazette* has been out of print for some years, and meantime we have occasionally had inquiry for the article. Therefore, we reprint it in full as below, having redrawn and considerably improved the diagrams which appeared with the original article.]

In complying with your request to give you some account of the "lap sidings" in use on this Division, some statement of the general situation seems necessary. The Cleveland & Pittsburgh Railroad, operated as one division of the Pennsylvania Lines West of Pittsburgh, is still further divided into three operating divisions, viz.:

The Tuscarawas Branch, 31 miles long, on which three trains are run in each direction daily, built through a fine agricultural valley a generation since, when it was thought that the transportation of the products of the farm would alone afford a profit.

The River Division, running for 94.5 miles along the Ohio River, with a heavy local traffic, and receiving on the upper 25 miles a large accession from the main line. While the curvature is, of course, great, the low grades (maximum 20 ft.) enable us to haul with consolidation engines, carrying 41 tons on the drivers, trains of 60 cars each, and so reduce their number that the problem of road service is a small one.

The Main Line from Cleveland to Wellsville, 101 miles, with its 153 curves of from 1 to 7 deg.; with its undulating gradients, varying the westbound trains 19 cars Wellsville to K N tower, 30 cars from that point to Hudson, and 36 cars from Hudson to Cleveland, the eastbound being uniform at 24 cars; with the lading consisting chiefly of coke, coal and iron ore, making the average carload 20.8 tons, the inertia excessive, and the braking difficult, and with an average of 52 trains daily throughout the year (27 per cent. being passenger), reaching frequently during the autumn 65 trains daily, and occasionally as high as 78, all of which must do work at seven first class stations is, as Kipling says, another story.

With the large and continuous growth in the business and but little change in the motive power, no addition to the track facilities had been made for many years until, in 1889, the question was taken up in earnest and the work of improvement vigorously prosecuted. The accompanying profile and plan show the situation as it was in 1889, and as it is at the present time, indicating the location and capacity of the passing sidings and the direction in which trains enter them when moving on their schedule rights. The short section showing align-

ment is taken from the most favorable portion of the line, the tangent on either side of Macedonia being the longest on the division.

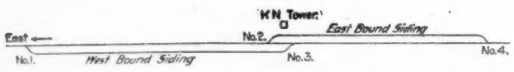
In locating the passings, lines were drawn on the profile at intervals of five miles, and the location then shifted in case the grades demanded it. No attempt was made to retain them at the stations, and we now feel a distinct relief in cases where they were moved out into the country, as almost every temptation to kill time on the siding has been removed. We still feel, for example, the effect of the movement on the lunch counter at Alliance. In some cases, as at K N tower, the siding was located at the point to which trains backed to make a run for the hill, in cases where formerly they had frequently stalled on it, entirely removing that difficulty. The removal of the sidings from Macedonia Hollow abolished the point of greatest danger on the road; and whereas, formerly, accidents at that place were of frequent occurrence, we have had since the reconstruction no accidents at Macedonia, Bosworth or Wheelock.

The location of our grades prevented our following the plan adopted by Mr. Turner on the Panhandle of having the trains in all cases feed toward the tower. (See *Railroad Gazette*, Sept. 12, 1890.) For example, at McGarry, a westbound train moving toward the tower and using the siding would lie for its entire length on the grade and would pull out very slowly and with great difficulty, and this is true of various other places. At nearly all the laps the two switches at the lap are governed by Stevens' levers in the tower, and a copy of the order putting the train on the siding is sent to the operator, who, in locations like McGarry, opens the switch for the train, which is thus able to enter the siding at about 10 miles an hour, and when released to drop out quickly. It is true that the engineer of the first section would, in case there were orders for him, have to walk back a half mile for them; but we are able usually to avoid sending orders to trains using the siding under this condition, and find this cause of delay but trifling, while the gain in time of movement is very considerable. We estimate a saving of eight minutes at the meeting point by having the operator control the switches and of six or seven minutes by avoiding the slow movement on the adverse grade. An advantage of 15 minutes in single-track movement is a great desideratum, often meaning the success of the entire trip.

We find the advantages of the lap sidings all that you claim for them in your article of Sept. 12, but feel that we have greatly increased their natural usefulness by our method of operating them. At first we numbered all main track switches, and meeting points were made, for example, at Salineville No. 10; but we felt this method to be hazardous as requiring an exact knowledge of many very complex situations, and finally adopted the following rule, which we placed upon the time card:

Only those switches connecting sidings with the main track at which trains are to be met by special order are numbered; No. 1 being the most easterly switch, and the numbers increasing toward the west. When trains meet at a numbered switch by special order, the train that can enter the siding without backing must do so.

This rule, in connection with the lap sidings, gives the despatchers a masterful control over the train movement, to what extent may perhaps be most easily made clear by the quotation of a few orders. Eastward trains have the absolute right of track under Rule 84. Trains 37 west, 38 east passenger, and 118 east freight, meet per schedule at K N tower.



Under normal conditions No. 37 would take siding at No. 1. No. 118 at No. 4, leaving the main track clear for No. 38. The lap avoids the backing out of the siding by No. 37 and enables it to pull out directly No. 38 has passed. Frequently, however, No. 37 is a trifle late. To hold it back at Summitville would delay it badly and 118 worse. Ordinarily it would be helped out by a time order against No. 38, and both trains be delayed while it took the siding. We make the movement by meet order:

"No. 37, engine 16, and No. 38, engine 14, will meet at K N tower, No. three (3)."

The order is short and explicit; the lap avoids the backing out of the siding by No. 38 and the use of the numbered switch avoids any delay whatever to No. 37 and does not add to the delay of No. 38.

If No. 38 be late, the order would read:

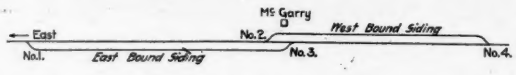
"No. 37 and No. 38 will meet at K N tower No. two (2)."

"No. 38 will run 10 minutes late, Bayard to K N tower."

"No. 37 will wait at K N tower No. three (3) until three fifty-seven (3:57) p. m. for No. 118, engines 88 and 63."

No. 37 is advanced a half mile westward, No. 118 is advanced three-quarters of a mile eastward, and No. 38 suffers no detention. This order is not often given under these conditions, but it is given with frequency when freight trains in each direction and one passenger train are to meet.

I said that we refrained as far as possible from sending orders to trains at points where they feed away from the tower. We often make this movement: No. 123, freight, is due at McGarry at 10:56 p.m., and is scheduled to meet No. 124, freight, due out at 10:56 p.m., and No. 88, freight, due out at 11:32 p.m. The order would read: "No. 123, engines 2, 31, 38, 90 and 35, First and Second No. 124, engines 61 and 42, and No. 88, engine 26, will meet at McGarry No. four (4)."



This puts the eastbound trains on the westbound siding and heads the engines past the tower, where they can get their orders.

No. 36 and No. 2 are eastbound passenger trains scheduled 10 minutes apart, No. 2 leaving the division at Hudson for Columbus and Cincinnati. Frequently they meet delayed freights at B Q tower, and an order is sometimes issued making a double track movement, the switches at the lap being thrown for the sidings by the operator. Substituting K N for B Q, so as to use the figure above, the order would read:

"Nos. 36 and 2 will wait at K N tower until eight forty (8:40) a.m. for 1st, 2d, and 3d 123, engines 25, 38 and 46, and No. 89, engine 26; Nos. 36 and 2 will take siding at K N tower No. four (4) and 1st, 2d and 3d 123 and No. 89 will take siding at K N tower No. one (1)."

As a rule, our freight trains are run in convoys of three sections and the sidings are built to hold three sections of loads, all the cars figured at 37 ft. It often happens that we are hauling a good many empties eastward, in which case it becomes necessary to side-track these trains on the longer westbound sidings, which is readily accomplished by orders similar to the example of one given at McGarry. In fact, a considerable number of combinations will at once be apparent which will go far towards explaining our experience that it is next to impossible to get trains in such shape as to cause a block at one of our passing sidings.

Of course, the questions always asked of any new scheme are, What did it cost? What are the results? Is the first justified by the last?

We did some work on every passing siding on the division. Some were simply lengthened out, the main track shifted in position and the lap formed by a cross-over. At some points a new siding was built on the opposite side of the main track, and in the majority of cases new sidings were built entire in new locations, the material from the old ones abandoned being used in the new construction. Great care was taken to locate them so that they might eventually be incorporated in the future double track, this being in every case insisted upon. The entire cost of the 15 sidings, including additional right of way, bridges and culverts, grading, track, telegraph towers and the machinery at the towers, was $81,757.47 (including estimated cost of sidings at Earlville, not yet completed).

The most evident results may be said to be:

First. An added safety to the despatching, as many of the orders are sent to the operator as well as to the trains crews, adding this additional check to those provided in the uniform rules.

Second. The arrangement for the passing of trains at the meeting point is made by the despatcher, the one man who has a full knowledge of the entire situation, in a concise and perfectly definite order, saving time in the transmission, and giving celerity to the movement.

Third. The better location of the passing sidings avoids many and extensive accidents, the precise money saving from which it is impossible to estimate accurately, but which may be approximately estimated from the following figures:

Wrecks.	Total Cost.
1890, 11 months	$6,447.40
1887	16,967.42
1888	6,898.28
1889	2,233.95

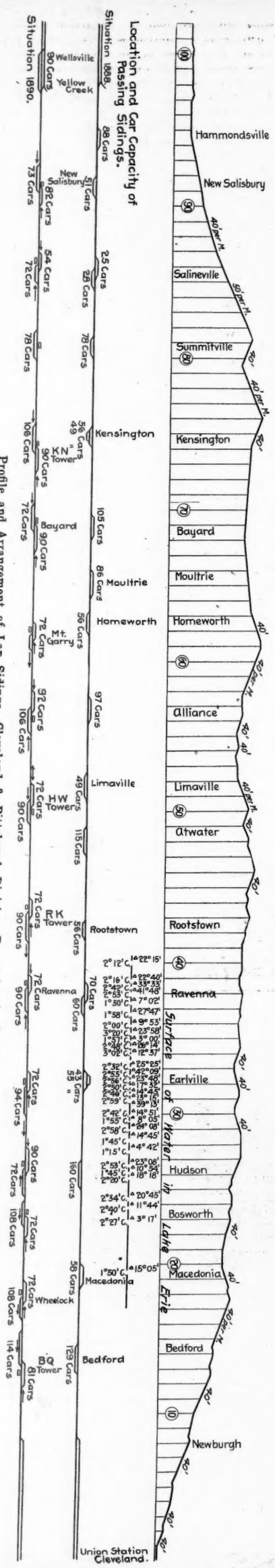
Fourth. Each westbound freight train will average four meeting points on the road in which with the usual straight sidings the trains will first pull into the siding, then back out and then pull ahead on the main track, running in each case 1.4 miles, which are avoided by the use of the lap sidings. Limiting this extra mileage to the westbound freight trains, though it frequently applies to westbound passenger, and sometimes to eastbound freight, we have for the daily movement a saving of 106.4 miles. Wellington, in his "Railway Location," page 170, gives the average cost per train mile for the roads of the United States at 90.3 cents, of which the items involved in the movement under consideration amount to 43.93 cents per train mile; the wages of engine and train crew being taken at the present average proportion of overtime. As these figures are for the mileage between terminals, and include the extra running at passing points, they should be here reduced to 41.6 cents per train mile when the total distance run is considered. This would show for the 19 daily average westbound freight trains an expense of $44.26 and for the year of 300 days $13.278.72.

Fifth. Prior to February, 1888, we paid overtime after 12 hours; since that date the runs have been divided on the basis of a speed of 10 miles an hour and overtime paid on that basis, making it accrue on this division after the train has been on the road 10 hours. Under the present practice the overtime for November, 1887, would have approximated $2,000.

The amount paid in November of each year is as follows:

November, 1887	$ 964.08
November, 1888	1,767.65
November, 1889	1,407.30
November, 1890	394.02

The problems of conducting transportation, as I understand them, are to move fast and slow traffic over the



Profile and Arrangement of Lap Sidings—Cleveland & Pittsburgh Division, Pennsylvania Company.

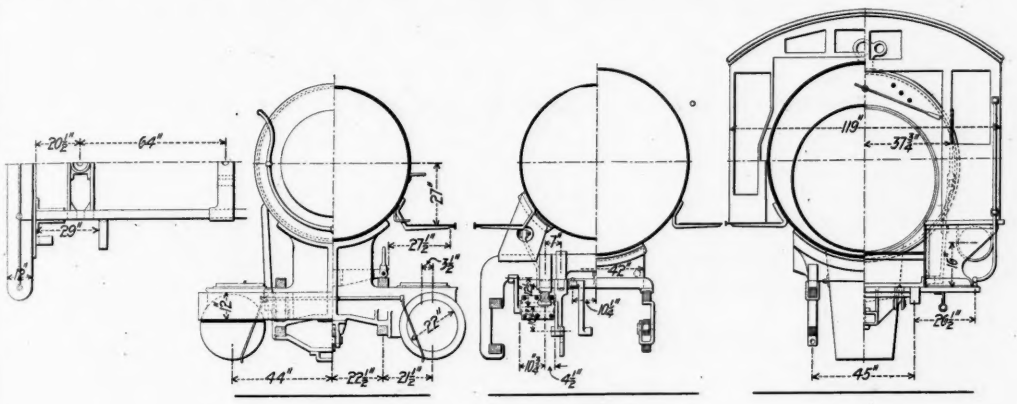
Note.—The passing sidings as in 1888 are shown in the upper plan; as in 1890 by the lower one. The scale is distorted to show the sidings clearly.

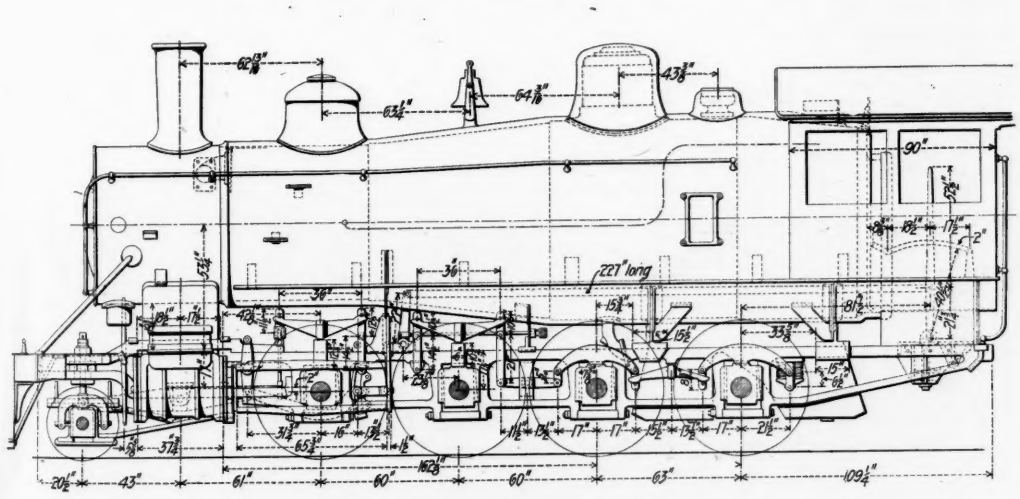
same piece of track, and to so arrange the making up and work of the trains as to secure punctuality and despatch.

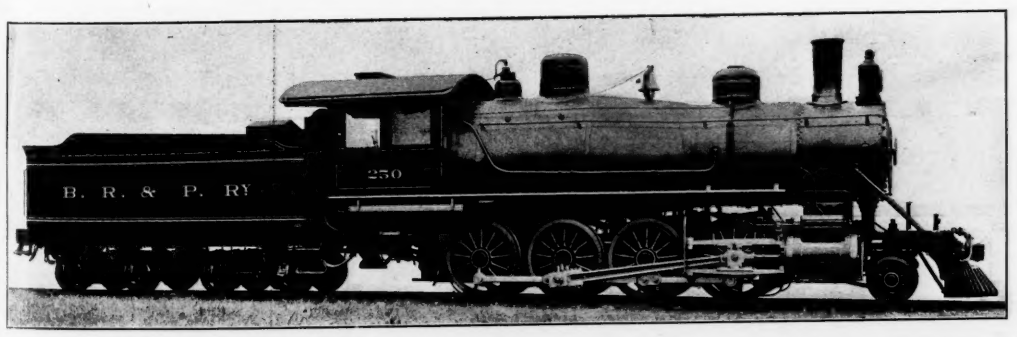
For the solution of the first problem for single track roads we offer, in the language of the patent attorney, what we believe to be a new and novel invention, being a combination of the lap siding suggested by Mr. E. W. McKenna, then Superintendent J., M. & I. Division, in an article read by him before the Train Despatchers' meeting at Louisville, Ky., in 1884, and first brought into practical use by Mr. J. J. Turner, Superintendent of the Eastern Division, Chicago, St. Louis & Pittsburgh Railroad, at Plain City, Ind., in 1887, with the use in train orders of numbered switches recommended by Mr. J. A. Anderson, then Superintendent Belvidere Division, Pennsylvania Railroad, in "The Train Wire," published in 1883.

Vanderbilt-Baldwin Consolidation Locomotive—Buffalo, Rochester & Pittsburgh Railway.

In the *Railroad Gazette*, May 10, page 316, we mentioned a consolidation locomotive, with Vanderbilt boiler, to be built at the Baldwin Locomotive Works for the Buffalo, Rochester & Pittsburgh Railway. This locomotive, No. 250, was delivered some time ago and the design







Vanderbilt-Baldwin Consolidation Locomotive—Buffalo, Rochester & Pittsburgh Railway.

is here illustrated from a photograph and drawings showing general elevation and cross sections of the locomotive. In the article of May 10, reviewing all that had then been done in applying the Vanderbilt boiler to locomotives; and again on May 31, page 366, in a description of the Illinois Central 10-wheel freight engine having this boiler, we illustrated the several modifications of boilers having a cylindrical fire-box. The drawings for boilers of consolidation engines shown in the issue of May 10 will make clear the present description as far as the boiler is concerned.

The Buffalo, Rochester & Pittsburgh engine is simple; has cylinders 22 x 28 in.; 377 flues, 2 in. diam.; 2,585 sq. ft. of heating surface; 33 sq. ft. of grate area; 151,900 lbs. on drivers and 17,700 lbs. on the engine truck, making the total weight of engine in working order 169,600 lbs. These, with other important features, are given in the general specifications.

Balanced slide valves are used and the eccentrics are on the No. 2 driving axle. Motion bars are attached to the link blocks and pass under the No. 1 driving axle to the rocker arms, which are located on the frame just back of the cylinders. This arrangement gives short eccentric blades and also very short valve stems. The working steam pressure is 200 lbs. per sq. in.

GENERAL SPECIFICATIONS.

Description.

Type	Consolidation
Name or number	No. 250
Name of builder	Baldwin Loco. Works
Name of operating road	Buffalo, Rochester & Pittsburgh
Gage	4 ft. 8½ in.
Simple or compound	Simple
Kind of fuel to be used	Bit. coal
Weight on drivers	151,900 lbs.
Weight on truck wheels	17,700 lbs.
Weight, total	169,600 lbs.
Weight, tender loaded	120,000 lbs.

General Dimensions.

Wheel base, total, of engine	23 ft. 11 in.
Wheel base, driving	15 ft. 3 in.
Wheel base, total (engine and tender)	53 ft. 7¾ in.
Length over all, engine	42 ft. 6 in.
Length over all, total, engine and tender	63 ft. 5 in.
Height, center of boiler above rails	8 ft. 4¼ in.
Height of stack above rails	14 ft. 8¾ in.
Heating surface, fire-box	135 sq. ft.
Heating surface, tubes	2,450 sq. ft.
Heating surface, total	2,585 sq. ft.
Grate area	33 sq. ft.

Whcels and Journals.

Drivers, number	8
Drivers, diameter	56 in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	30 in.
Journals, driving axle, size	9 x 10 in.
Journals, truck axle, size	6 x 10 in.
Main crank pin, size	6½ x 6½ in.

Cylinders.

Cylinders, diameter	22 in.
Piston, stroke	28 in.
Piston rod, diameter	3¾ in.
Kind of piston rod packing	United States Multi-Angular
Main rod, length center to center	10 ft. 4¾ in.
Steam ports, length	19 in.
Steam ports, width	1⅜ in.
Exhaust ports, length	19 in.
Exhaust ports, width	2¾ in.
Bridge, width	1⅛ in.

Valves.

Valves, kind of	Balanced, with vac. valves
Valves, greatest travel	5¾ in.
Valves, outside lap	⅞ in.
Valves, inside lap or clearance	0 in.
Valves, lead in full gear	1-16 in.

Boiler.

Boiler, type of	Vanderbilt
Boiler, working steam pressure	200 lbs.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	11-16 and ¾ in.
Boiler, diameter of barrel	66 in.
Seams, kind of horizontal	Sextuple riveted butt joint
Seams, kind of circumferential	Double riveted lap
Thickness of tube sheets	½ in.
Dome, diameter	30 in.

Fire-Box.

Fire-box, length	94 in.
Fire-box, width at grate	57 in.
Fire-box material	Steel
Fire-box, thickness of sheets	⅜ in.
Fire-box, brick arch?	Yes
Grate, kind of	Rocking bars and drop

Tubes.

Tubes, number	377
Tubes, material	Iron
Tubes, outside diameter, No. 12 W. G.	2 in.
Tubes, length over sheets	12 ft. 6 in.

Smoke-Box.

Smoke-box, diameter	66 in.
Smoke-box, length	59¼ in.

Other Parts.

Exhaust nozzle, double	High.
Exhaust nozzle	Permanent
Exhaust nozzle, diameter	3¾, 4 and 4¼ in.
Exhaust nozzle, distance of tip below center of boiler	4⅝ in.
Netting	Wire
Stack	Straight
Stack, least diameter	18 in.
Stack, greatest diameter	19¾ in.
Stack, height above smoke-box	3 ft. 7¼ in.

Tender.

Type	4-wheel swivel truck
Tank capacity for water	6,000 gallons
Coal capacity	10 tons
Kind of material in tank	Steel
Thickness of tank sheets	¼ in.
Type of under-frame	Iron
Type of truck	Arch bar
Truck has	Rigid bolster
Type of truck spring	Full elliptic
Diameter of truck wheels	33 in.
Diameter and length of axle journals	5½ x 10 in.
Distance between centers of journals	77 in.
Diameter of wheel fit on axle	6⅞ in.
Diameter of center of axle	5⅞ in.
Type of truck bolster	I-beam
Type of truck transom	Iron
Length of tender frame over bumpers	22 ft. 6 in.
Length of tank	20 ft. 11 in.
Width of tank	9 ft. 9 in.
Height of tank, not including collar	4 ft. 8 in.
Height of tank over collar	6 ft. 3 in.
Type of back drawhead	Tower coupler
With or without water scoop	Without

Special Equipment.

Wheel centers	Standard Steel Works
Tires	Standard Steel Works
Axles	Standard Steel Works
Sight-feed lubricators	Michigan
Front and back couplers	Tower
Safety valve	Consolidated
Sanding devices	Leach
Injector	Hancock Composite
Driver brake equipment	American O. S. Equal.
Tender brake equipment	Westinghouse
Tender brake beam	"The Solid"
Driver brake-shoe	Ross Modified
Air-pump	9½ in. Westinghouse
Steam gages	Ashcroft
Engine truck springs	Half-elliptic
Driving springs	Half-elliptic
Tender springs	Full elliptic
Piston-rod packings	U. S. Multi-Angular
Valve rod packings	U. S. Multi-Angular

The Taylor-White Process for Treating Tool Steel.

A record of tests made at South Bethlehem, Pa., with tool steel treated by this process was published in the *Railroad Gazette*, Aug. 10, 1900, page 539. Some further information is here extracted from a paper presented by Mr. Charles Day, at the Franklin Institute, April 17. The title of Mr. Day's paper is "The Taylor-White Process of Treating Tool Steel and Its Influence on the Mechanic Arts." The paper gives special attention to the use of this steel in the work of the Link-Belt Engineering Co. and shows some notable economies in production, a few of which are here given.

About 97 per cent. of their material is cast-iron, requiring much handling and relatively little machine work. For a rough test on cast-iron one tool was put on a 7-ft. boring mill, turning the inside of a cast-iron ring. Ordinarily, about 14 hours was required to finish the work in hand and with the Taylor-White tool the time was reduced to three and one-half hours, a gain of 75 per cent.

Some interesting information was also obtained in turning rope sheaves. With the old tools, nine and one-half hours was required on an average to machine 13 sheaves. Sixteen similar sheaves, on which the roughing was done with Taylor-White tools were machined in five hours and five minutes, a saving of 46½ per cent. This record included the time for all stages of the operation, namely, setting up, forming groove with special tool, boring, polishing, and roughing. The gain in the process of roughing alone, where the merits of the ordinary and the Taylor-White tool were directly contrasted, was 56.3 per cent. The entire order of sheaves of which the above-mentioned work was a part, required 1,569 hours' work. This showed a gain of 501.25 hours on the total operation, 31.95 per cent. better than the best previous record. The results with boring cutters made of this steel have been particularly pleasing, the actual time being sometimes reduced 60 per cent. for a given duty. A test was made in boring $1^3/_{16}$-in. collars in one cut, the core being 1 in. The metal speed at point of cutter was 77 ft. per minute and the regular cutter lasted 10 seconds. The treated cutters bored four collars successfully.

To get a greater refinement of cutting speed, individual electric motors have been put on some of the larger machine tools and it is intended later to use the motor drive for all machines in the works of the Link-Belt Engineering Co.

New Shops at Hannibal, Mo.—Hannibal & St. Joseph Railroad.

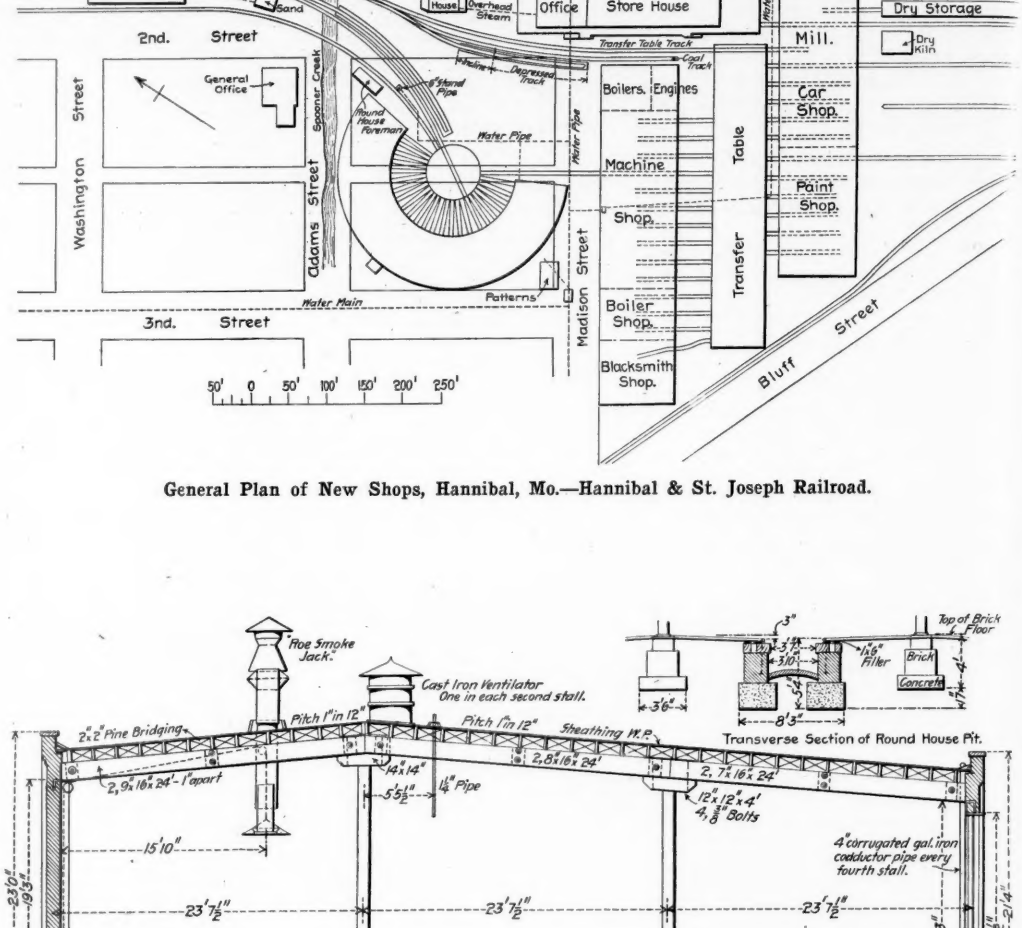
Hannibal, Mo., is the site of one of the earliest railroad shops in the west. In 1855 the Hannibal & St. Joseph R. R. built there what were considered at the time one of the most complete shops in the country; shops which, with slight changes, have done good service for nearly half a century. The growing business of the Burlington Company between St. Louis and the West has for several years made it apparent that the old shops would soon have to be replaced. Early in 1899, Mr. Howard Elliott, the General Manager of the properties of the Chicago, Burlington & Quincy, in Missouri, obtained authority to rebuild and install a plant that would furnish necessary facilities for doing all repair work on that part of the road. These plans have now been carried out.

The new shops, referred to in our issue of Oct. 5 last, are complete and modern and have the appearance of being intended for service for at least another half-century to come. They were planned by Mr. F. A. Chase, General Master Mechanic of the Burlington System in Missouri, and, as shown by the general plan, are laid out in such a manner as to combine economy of space with the greatest convenience in handling material and rolling stock. Locomotives or cars may be run from the yards onto the transfer table and delivered to any part of the machine, boiler, car or paint shops, while the various shops are located with a view to reducing the cost of transporting material. The blacksmith shop adjoining the boiler shop and machine shop, the mill adjoining the car shop and having the dry storage house and dry kiln close at hand, and the storehouse being close to both main buildings prevents loss of time and accelerates the work in the shops. The handling of material from the storehouse, and from one shop to another is still further facilitated by tracks running partly around and between the various buildings and provided with turn-tables at intersections, upon which push cars are easily handled. Cars are brought very near the northeast corner of the machine shop on a depressed track so that wheels and axles may be loaded or unloaded at ground level, and an overhead track with trolley and air lift is being installed to convey them to and from the storage tracks, and in or out of the shop; at the same time the arrangement of the tools in the various shops is such that so far as possible work may progress naturally from one process to the next.

The design of the buildings and their erection, as well as the construction work generally, were in the hands of Mr. L. F. Goodale, Chief Engineer of the Missouri Lines. As will be seen from the detail description later, everything pertaining to this part of the work has been carried out with great care and with special regard to strength and durability. The power plant and electrical equipment were designed by and installed under the direction of Mr. C. H. Wilmerding, Consulting Engineer of Chicago. In this department the first consideration has been flexibility and economy of operation. The plan adopted of individualizing as far as practicable each machine and doing away almost entirely with shafting greatly reduces the unproductive load, and should make this plant the most economical in power of any railroad shops yet equipped electrically.

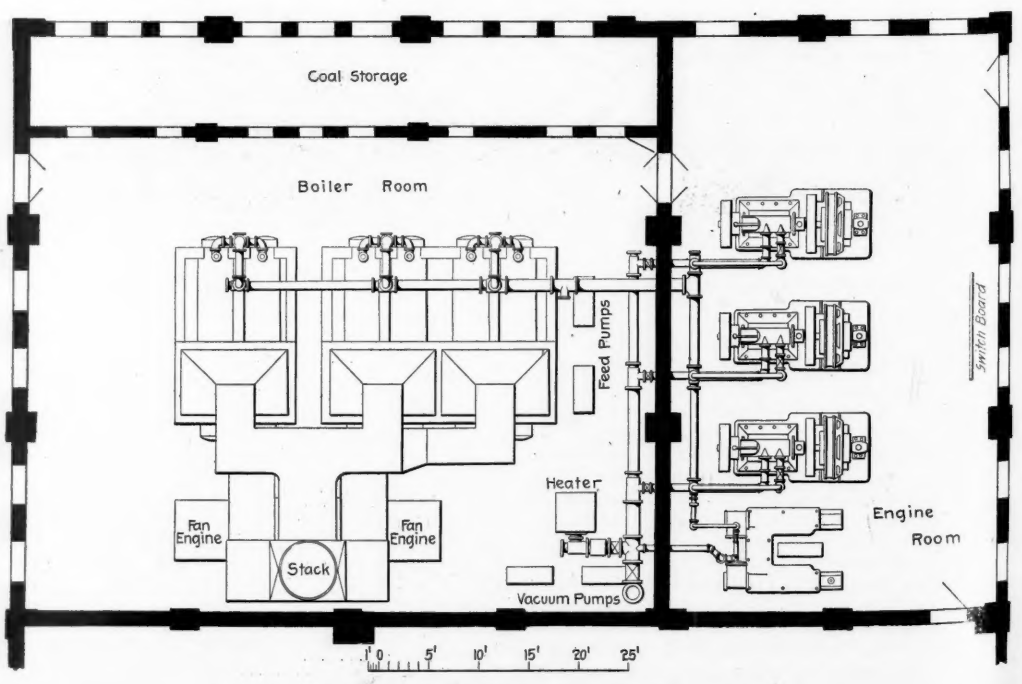
The repair shops proper are contained in two main brick buildings, the more northerly of which, 439 ft. x 102 ft., is the machine, boiler and blacksmith shops and includes the power house at the easterly end. The center height in the machine and boiler shops is 43 ft. 3 in., in the blacksmith shop 31 ft. 6 in. and in the power house 27 ft. 6 in. Steel roof trusses are used in this building. Those in the blacksmith shop span the full width of the building, while those in the machine and boiler shops are divided into two spans on a line 33 ft. from the north wall, where they are carried on 34-ft. steel columns which serve also to support 36-in. plate girders extending to the north wall and supporting a gallery 292 ft. long and 18 ft. 4 in. above the floor line. Beneath this gallery are placed the machine tools, while the remaining 66 ft. of width is occupied by locomotive pits. There are 10 pits in the machine shop and three in the boiler shop. Above them is a Pawling & Harnischfeger 15-ton electric traveling crane, having a span of 62 ft. 9 in. and a run of 292 ft. The gallery, reached by an elevator and two stairways, is used in part for a lavatory of 72 basins, toilet rooms and lockers for the employees, and for the storage of patterns. The east half is used for light machinery, repairing air pumps, air-brake fixtures, link work, etc. The large windows and a skylight extending the length of the building afford excellent light in every department.

The southerly building is 373 ft. long and 102 ft. wide, the east 86 ft. of it being two stories high and occupied on the ground floor by the wood mill and on the second floor by the cabinet and upholstery shops. The remaining length of the building, having a center height of 30 ft., is divided between the car shop and paint shop, the former with five and the latter with six tracks. In this building columns are used for the support of the roof trusses and as in the engine shop, generous provision is made for daylight. Between these two main buildings is a transfer pit 389 ft. long and 70 ft. 4 in. wide, the table, built by George P. Nichols & Bro., of Chicago, being electrically driven and having a capacity of 150 tons. The eight 75-lb. rails upon which the table travels are laid on heavy wooden stringers bolted down to concrete foundations, while between the rails the pit



General Plan of New Shops, Hannibal, Mo.—Hannibal & St. Joseph Railroad.

Longitudinal Sections of Roundhouse and Pit.



Plan of Power House—Hannibal, Mo.

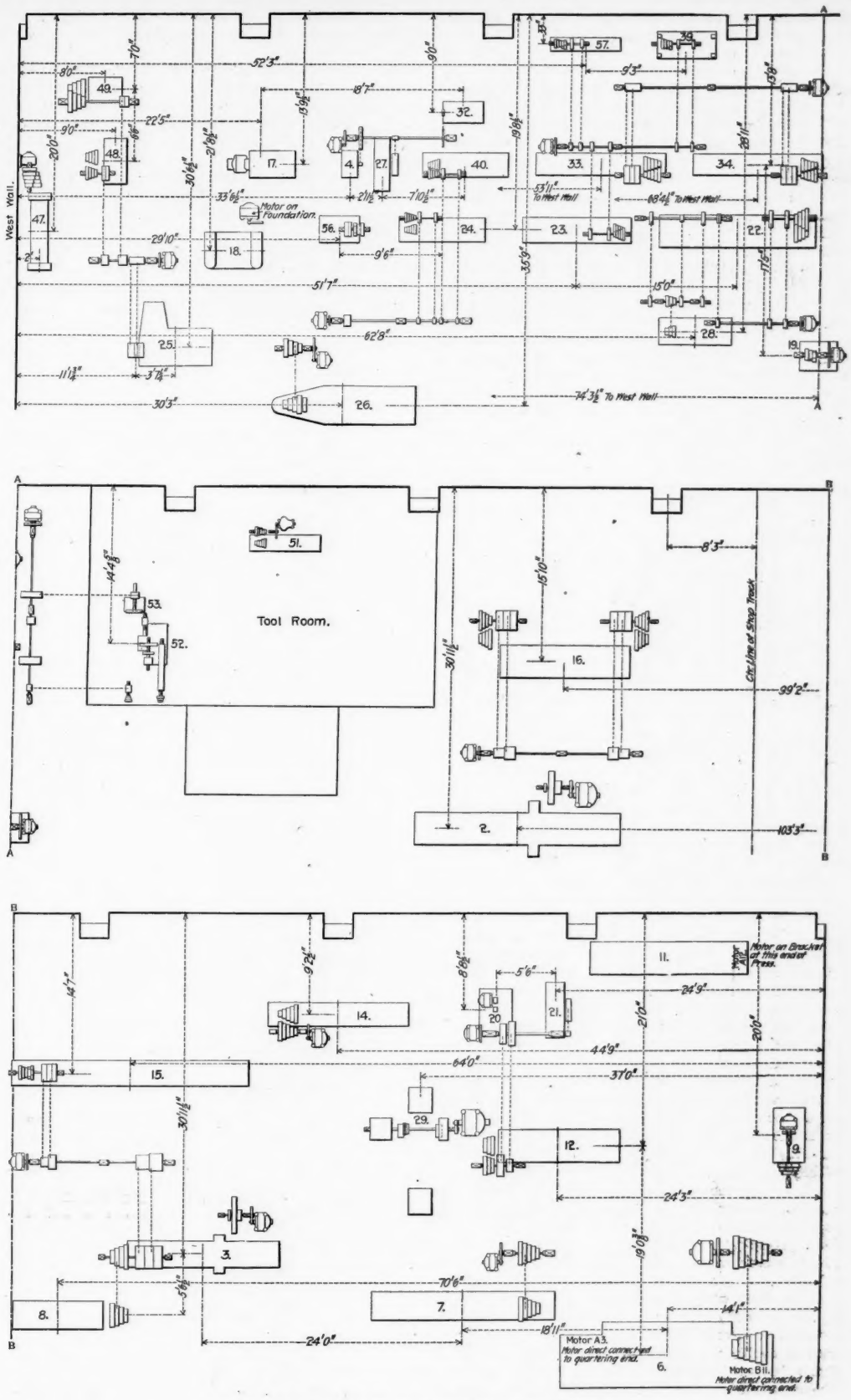
is paved with brick and drained through sewer connections.

South of the wood mill are a dry kiln and extensive lumber storage sheds and opposite the east end of the engine shop building is a brick storehouse 250 ft. x 50 ft., on the second floor of which are the offices of the master mechanic and the supply agent. The roundhouse, of 24 stalls with electrically driven turn-table, is north of the engine shop, and adjoining it is a small two-story brick building used as a tinner's shop. Still further to the north is a three-story general office building, used by the operating officers of the road, and the oil house, coal chutes, sand tower and icing plant.

Power House.—The power house is located so as to be practically at the center of distribution, and consists of a boiler room, 63 ft. 7 in. x 56 ft. 7 in., and an engine room, 33 ft. 6 in. x 56 ft. 7 in., with a 17-in. brick fire wall between. In the boiler room the coal bins occupy a space 10 ft. wide running the length of the east side, and are filled directly from cars on a side track while the coal is fed to the magazines of the furnaces by hand from openings in the partition wall. The ashes are loaded into cars brought close to the north side of the boiler-room on a depressed track.

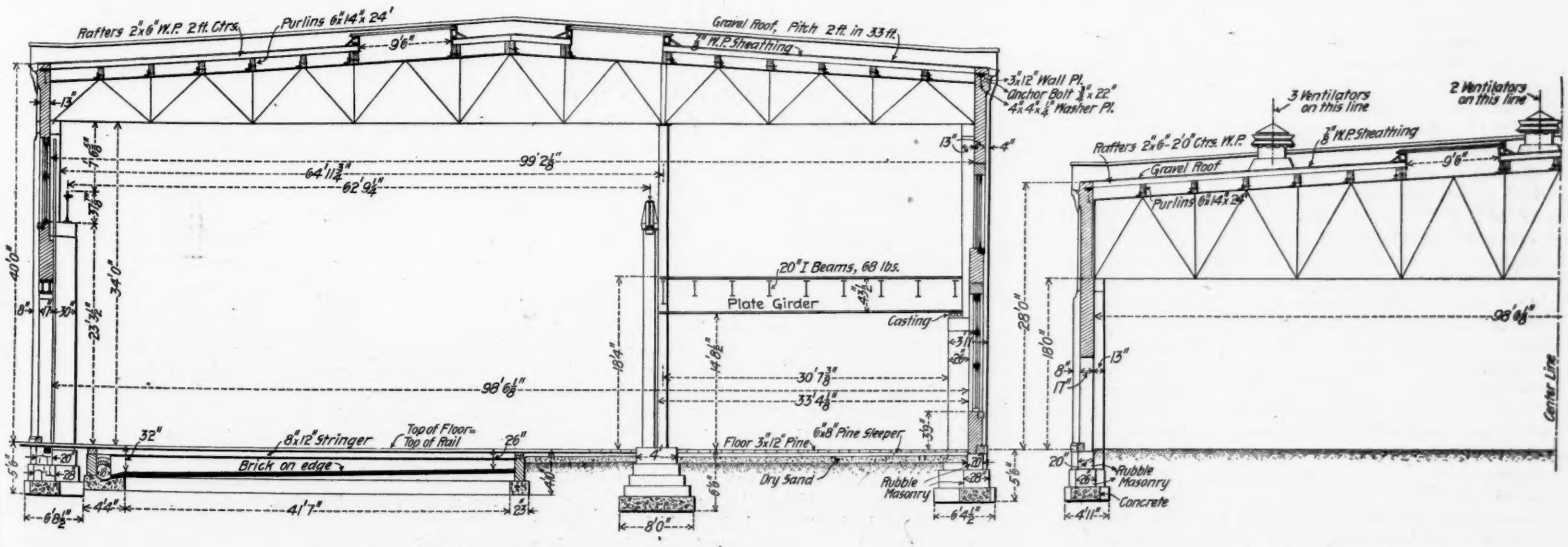
The boiler plant consists of three Heine boilers, each of 2,223 sq. ft. heating surface and equipped with Murphy furnaces. Space is provided for a fourth boiler should future additions require it and all piping and auxiliary apparatus is of sufficient capacity to take care of this possible increase. These boilers, in addition to furnishing steam for the power house engines and accessories, are called upon to supply the air compressor, two steam hammers in the blacksmith shop, steam for locomotive boiler and air-brake tests and live steam, if necessary, for heating. Directly back of the boilers is an induced draft plant furnished by the American Blower Co., of Detroit, consisting of two fans with independent single cylinder marine type engines, either fan capable of developing 1½-in. draft at full boiler load. A short 72-in. steel stack takes the gases to a point 5 or 6 ft. above the roof. A mechanical draft is particularly desirable at this point on account of a high bluff quite close to and southwest from the power house. Two Worthington duplex feed pumps, 9 in. x 5¼ in. x 10 in. (one for reserve), are placed directly south of the south boiler and take water from a Webster heater. One of two vacuum pumps, installed in connection with the Webster vacuum system of heating, discharges the return water into this heater which also receives, in addition to the steam pipe drips, the heated water from the water cooled bearings of the induced draft fans and that from the intercooler and jackets of the air compressor. The heater also furnishes such hot water as is needed for lavatory purposes throughout the shops. A small Quimby pump, driven by a direct-connected 1-h.p. motor takes the hot water from the heater and delivers it through a 1½-in. pipe to the various lavatories; there being, however, a small ½-in. return pipe from the ends of the delivery pipes back to the heater, thus establishing a circulation and assuring hot water at all times. The motor is automatically controlled by a solenoid controller actuated by a pressure regulator so that when the pressure on the system is relieved by the opening of faucets the motor is speeded up and the pump accelerated to meet the demand. The boiler room also contains a large steel hopper, erected over the coal bins to receive the shavings from the wood mill. These are forced over, through a 28-in. pipe about 250 ft. long, by an electrically-driven, double-size, 50-in. Sturtevant exhauster. The hopper has a capacity for about a carload of shavings which are fed to the furnaces during the night run.

The engine room is equipped with three Westinghouse compound, non-condensing engines, 14 in. x 24 in. x 14 in., direct-connected to General Electric, 150-k.w., eight-pole, 250-volt generators at 280 revolutions a minute. Two of these will carry the maximum electric load, the third being a reserve. In line with these engines is a Rand Drill Co., Imperial No. 10, air compressor with compound air cylinders and intercooling device, having a capacity of 700 cu. ft. of air per minute. A seven-



Location of Machines in Machine Shop—Hannibal, Mo.

Note.—These three plans should be placed end to end as indicated by the lines AA and BB.



Transverse Section of Machine Shop—Hannibal, Mo.

Half Transverse Section of Blacksmith Shop. (Both Sides Alike.)

panel switchboard of white Italian marble, equipped with Weston instruments and I. T. E. circuit breakers on the power feeders, faces the generators.

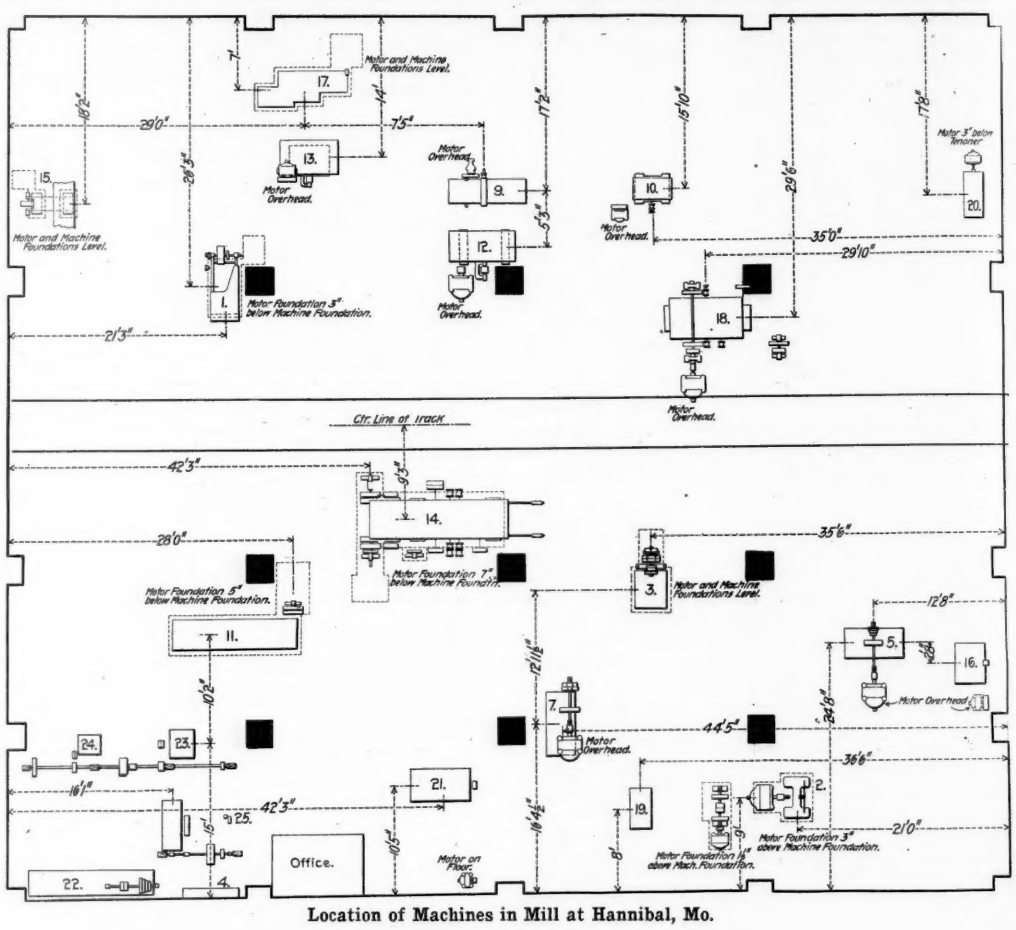
The steam piping, carrying a pressure of 155 lbs. at the boilers, is supplied throughout with extra heavy fittings and valves. The boiler header is supported above the boilers, and connections from each boiler are led into it from above, each connection being in the shape of an inverted "U" and containing an automatic stop and check valve as well as a gate valve. A 6-in. branch from the boiler header (not shown in the plan of the power house) furnishes steam to all auxiliary apparatus and, through a pressure reducing valve, live steam to the heating system if required. The engine header runs at right angles to the boiler header and is supported on brackets on the south side of the dividing wall between the boiler and engine rooms. Connections to the engine are made with wrought iron bends, 5-ft. radius, springing from the top of the header. The main exhaust pipe is supported on the north side of the dividing wall in the boiler room and leads through a large oil extractor to the heater and the heating mains, and through a Keiley back-pressure valve to a free exhaust pipe in the southwest corner of the boiler room. The McLeod Co., of Chicago, was the contractor for this work. All steam and exhaust piping, the boiler drums and the heater are insulated with No. 1 magnesia, and the breeching and induced draft fan casings with No. 2 magnesia, furnished by Walsh & Wyeth, of Chicago.

Distribution.—The distribution of current, both for power and lighting, is effected on a two-wire, 230-volt system. Separate power feeders supply each of the two main buildings, the transfer table and the turn-table; while one of the four lighting feeders supplies the engine shop building, one the car shop building, one the roundhouse, offices, storehouse and all other outside buildings, and the fourth the arc lamps for lighting the yards. Grimshaw white core wire is used throughout, the inside wiring being carried on insulators in all the shops except the machine shop, where loricated conduit is used. In all cases where wires are brought down within reach, for direct-connected motors and for rheostats, they are also carried in iron conduit, for safety and for mechanical protection. Cast-iron, slate-lined cut-out cabinets with plate glass doors and fitted with Noark fuses are used at all centers of distribution, both for power and lighting. The wiring was done by Kohler Bros., of Chicago.

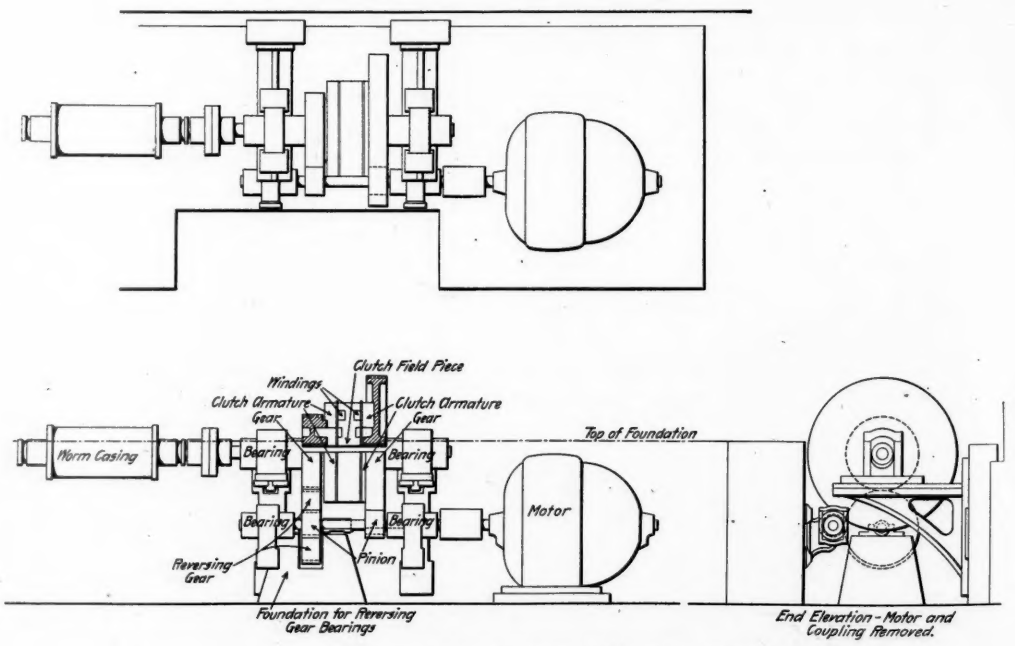
Machine Shop.—The inside dimensions of this shop are 225 ft. x 98½ ft., with a gallery 33 ft. wide extending the length of the north side. With the exception of a large planer, all the machine tools are placed under this gallery and driven either by direct-connected motors or by inverted motors attached to the under side of the gallery, and direct-connected or geared to short countershafts carrying the necessary cone pulleys from which belts are run to the tools below. The 48-in. lathe, 42 and 32-in. planers, 18-in. slotting machine, 90-in. driving wheel lathe, and large radial drill stand just enough outside of the gallery so that work can be handled to and from these machines with traveling crane. There are 40 tools in this shop. These 40 machines are driven by 29 Crocker-Wheeler, semi-enclosed motors aggregating 172 h.p. This make of motor is used throughout. Where machines are grouped, no more than three are driven by one motor, so that practically no motor need run, no shafting need be turned and no machine need be kept in motion except when useful work is being done. A novel and interesting application of electric power is seen in the equipment of the 54-in. planer in this shop. The shaft which carries the worm for driving the rack wheel beneath the table, and which is usually provided with pulleys to receive the open and crossed belts from an overhung countershaft, is equipped with a double magnetic clutch, the field piece of the clutch having two windings, one let into either face. The armature rings, one on each side of the field, are bolted to the sides of gear wheels which are driven from pinions on the extended shaft of the motor. One of these pinions meshes directly with one of the gears, while a gear wheel is interposed between the other pinion and its gear to give a reverse motion. The field piece is keyed to the worm shaft while the gear wheels carrying the armature rings run on phosphor bronze bushings. The motor runs always in the same direction and consequently the two bushed gears on the worm shaft turn continually in opposite directions. When current is passed through the magnetising coil on one side of the field piece it is drawn up to the adjacent armature ring, and the field piece, and consequently the worm shaft turns with the gear on that side. When the other coil is energized, it is drawn to the other armature ring and turns with the other gear in the opposite direction. The change in the flow of current from one coil to the other is effected automatically by an ingenious switch attached to the frame of the planer and actuated by dogs set at desired points on the moving table. While the energy consumed in the clutch is only about 100 watts, there is absolutely no slip with the heaviest cuts and the operation is highly satisfactory. That part of the machine shop beyond the gallery, 66 ft. wide, is occupied by 10 engine pits, an ample space being left between the ends of these pits and the line of the gallery for a clear passage or "midway." Covered racks are provided between these pit tracks in the 45 ft. between the building and the transfer pit, to receive the parts of dismantled locomotives.

Boiler Shop.—This shop is practically a continuation of the machine shop and measures 67 ft. x 98½ ft. The gallery referred to extends also through this shop and the traveling crane serves the entire length of both shops. There are in all eight machines. Besides these there is a large flanging fire. Five motors are used to operate the six power-driven tools aggregating 61½ h.p. A 35-h.p. motor with magnetic clutch equipment, so that the rolls and the raising and lowering of the upper roller may be operated independently by the same motor, is used for the large bending rolls. The double punching and shearing machine is driven by a 6-h.p., eight-pole motor at 200 r.p.m., the armature being mounted on the driving shaft.

Blacksmith Shop—This shop is 84 ft. x 98½ ft., and contains the following machines: One punch and shears; one bolt header; one bolt shears; one Bradley hammer; two steam hammers, and one grindstone. With the exception of the steam hammers these machines are also electrically driven, four motors aggregating 22½ h.p. being required. Two furnaces are provided in this shop and 10 down-draft forges operated by a blower and a fan, both of Sturtevant pattern, and placed at the west end of the gallery over the boiler shop. One 10 and one 15-h.p. motors are used to drive them. A large shed at the end of the blacksmith shop is used for storing stock.



Location of Machines in Mill at Hannibal, Mo.



Equipment for 54-in. Planer at Hannibal Shops.

Wood Mill.—The easterly 86 ft. of the car shop building, 98½ ft. wide, is utilized on the ground floor for the wood mill and contains 24 machines. Each of these, with the exception of the small saw sharpeners, grinding machines and the 24-in. lathe, which are driven from a common shaft, are equipped with independent motors, there being 19 in all, aggregating 275 h.p. In most cases the motors are direct-coupled or geared to the machines and placed on the machine foundations, though in a few instances, where circumstances require it, they are attached to the ceiling and belted. A track from the yards enters the mill so that material may be brought directly to the machines, or shipped out finished with a single handling. Each machine is equipped with the necessary hoods for carrying away shavings, and a double-size 50-in. Sturtevant exhauster attached overhead and driven by a 50-h.p. motor delivers them to the hopper in the boiler room. The shavings system was installed by the Allington & Curtis Mfg. Co., of Saginaw.

Cabinet and Upholstery Shops.—These occupy the second floor of the wood mill and are reached by an elevator and a stairway. The floor, supported on 36-in. plate girders resting on heavy cast-iron columns with 20-in. 80-lb. I-beams, is designed to carry 350 lbs. per sq. ft. The following machines are placed on this floor: One pattern lathe; one tenoner; one hollow chisel mortiser; one hair picker; one scroll saw; one universal saw bench and one sewing machine. The five machines in the cabinet shop are each independently driven with five motors aggregating 22 h.p., while the hair picker and the sewing machine in the upholstery shop are run with a 2-h.p. motor.

Car Shop.—This shop adjoins the mill on the west and occupies a space 114 ft. long by 98½ ft. wide. It contains five repair tracks connecting with the transfer table, and in the southwest corner are toilet rooms for the men in this building.

Paint Shop.—The paint shop lies west of the car shop and is 167 ft. x 98½ ft. There are six tracks provided and at the west end is an office and a paint

room, together with a small room used for brass buffing. A 2-h.p. motor drives the buffing wheels as well as a paint mixer.

Transfer Table.—The transfer table, 70 ft. in length, has a capacity of 150 tons. It is operated with two 25-h.p. motors in series-multiple, which receive current from a trolley line supported on latticed steel columns along the north side of the pit. By means of friction clutches, the power may be applied to a winding drum used to draw locomotives or cars onto the platform.

Turn-table.—This was built by the Lassig Bridge & Iron Works of Chicago and has a 66-ft. span. It is driven by a series, fully-enclosed motor of about 4-h.p., placed on a triangular steel frame hinged to one side of the table, and connected by double reduction gears to a traction wheel running on the circular rail in the pit. A controller and resistance is placed at each end of the turn-table so that the motor may be operated from either point.

Heating.—The two main buildings are heated by the Sturtevant blower method in connection with the Warren-Webster vacuum system. Exhaust steam is led from the power house to large steam coils over which air is drawn by 12-ft. Sturtevant fans and discharged through galvanized iron pipes to the various parts of the buildings. This apparatus for the locomotive shops is located about centrally on the balcony, while that for the car shops occupies a portion of the second floor of the mill. Each fan is driven by a 35-h.p. motor. The heating in the other buildings is accomplished by direct radiation, the condensation from both systems being returned to the feed water heater by means of vacuum pumps in the power house.

Lighting.—Enclosed type, G. I. 230-volt, arc lamps are used for general illumination in all the shops and for the lighting of the yards, while 230-volt incandescent lamps are supplied at each machine and for the lighting of the various offices and other buildings. In all there are 93 arc and 500 incandescent lamps connected.

Fire Protection.—A complete system of fire alarm is installed, making it possible to turn in a call from any part of the plant, and fire hydrants with coils of hose are placed at every convenient point. A special pumping plant for fire purposes is not required here, as the city water works furnishes a pressure of 90 lbs. per sq. in. In addition to these precautions the men are drilled for fire service.

The wisdom of the policy of subdividing the power and using individual motors in practically all cases, is demonstrated clearly in the results obtained at these shops. With a total rated capacity of 696 h.p. in motors connected the maximum switchboard load, which includes the motor and wiring losses, has not exceeded 200 h.p., or 29 per cent. of the connected load. This in spite of the fact that the piece work system is in use in the shops. This rated capacity of 696 h.p. includes all of the machine tools, 582 h.p.; a transfer table, 50 h.p.; a traveling crane, 44 h.p.; a turn-table, 4 h.p.; two elevators, 15 h.p., and the small hot water service pump, 1 h.p. In fact, with the whole electrical equipment in service excepting the 50 h.p. motor for the shavings exhaust, not yet installed, the 70 h.p. in motors for heating, and the lighting load, neither of which has been required since the plant went into operation, the maximum switchboard load, as said, has not exceeded 29 per cent. of the rated capacity. This low ratio could not possibly be obtained with a system of shafting. In fact, it is very unusual in plant driven by mechanical means of transmission that the power lost in the shafting, belting, etc., is as low as 33 per cent. of the maximum power applied. In other words, with a shafting system, the power applied for the same load under the most favorable conditions would not be less than 300 h.p., instead of 200 h.p. Including those motors which have not yet been placed in service, the total connected power load at the shops is 816 h.p., while the connected lighting load amounts to about 125 h.p., giving a total of 941 h.p. as the electric load on the station.

The complete power plant, which includes the foundations and all apparatus in the generating station, as well as the distributing system, motors, shafting, gearing and lighting and all appurtenances erected in place and ready to run, has been installed at something less than $90 per connected horsepower, while the power station itself represents a cost of $68 per horsepower rated capacity.

TOOLS AND MOTORS AT HANNIBAL SHOPS.

Machine Shop.

Machine No.	Machine.	Horse Power of motor.
1.	54 in. planer	15
2.	42 in. planer	10
3.	32 in. planer	7.5
4. 27. 32.	Emery grinder, Grindstone, Double centering machine	3
6.	90 in. driving wheel lathe	6
	2 quartering ends of same	3
7.	48 in. lathe	5
8. 15.	18 in. slotter, 22 in. shaft lathe	5
9.	Car wheel borer	5
11.	Car wheel press	10
12. 21.	Journal lathe, Grindstone	10
14.	32 in. lathe	4
16.	18 in. shaper	5
17.	40 in. vertical drill	2
18.	4 spindle gang drill	7.5
19.	Milling machine	3
20.	Grinding machine	3
22. 28.	32 in. lathe, Flat turret lathe	4
23. 39. 57.	18 in. lathe, 18 in. brass turret lathe, 16 in. lathe	4
24. 40. 56.	16 in. lathe, 16 in. lathe, Drill	5
25. 48. 49.	No. 5 radial drill, Acme triple bolt cutter, 2 in. double bolt cutter	5
26.	No. 6 radial drill	5
29.	No. 5 oscillating grinder	25
33. 34.	24 in. lathe, 24 in. lathe	5
47.	Acme nut tapper	3
51.	16 in. tool room lathe	2
52. 53.	No. 2 oscillating grinder, Twist drill grinder	5
58.	18 in. lathe on gallery, and other tools to be installed	5
	Elevator	7.5
	Motor capacity in machine shop	179.5

Boiler Shop.

1.	No. 6 Niles power bending rolls	35
2.	Double punch and shears	6
4.	Flue tumblers	15
5. 9.	Flue cutter, Flue scarfer	3.5
8.	Small punch	2
6.	Flanging fire	—
7.	Flue welder	—
	Motor capacity in boiler shop	61.5

Blacksmith Shop.

12. 17.	Bolt header, Grindstone	5
13.	Bolt shears	5
14.	Punch and shears	7.5
16.	Bradley hammer	5
10.	Large steam hammer	—
11.	Steam hammer	—
	Forge blower	15
	Forge fan	10
	Motor capacity in blacksmith shop	47.5

Wood Mill.

1.	Automatic cut-off saw	10
2.	38 in. band resaw	8
3.	Vertical borer	7.5
5.	Automatic car gainer	15
7.	Mortiser	15
9.	Buzz planer	7.5
10.	Single surfacer	13
11.	Planer and matcher	25
12.	Self-feed large rip saw	25
13.	Small rip saw	15
14.	Four-sided timber planer	45
15.	Power feed railroad cut-off saw	10
16.	Rip saw	15
17.	Outside moulder	22.5
18.	Double surfacer	17.5
19.	Upright moulder	9.5
20.	Large tenoner	7.5
21.	Scroll saw	2
22. 23. 24. 25. 4. 6.	24 in. wood lathe, Knife grinder, Sharpener and gummer, Band saw, setter and filer, Emery wheels, Grindstone	5
	Shavings exhauster	50
	Elevator	7.5
	Motor capacity in wood mill	332.5

Cabinet Shop.

2.	Pattern maker's lathes	5
3.	Scroll saw	3
4.	Tenoning machine	5
5.	Hollow chisel mortiser	4
6.	Universal saw bench	5
	Motor capacity in cabinet shop	22

Upholstery Shop.

1.	Sewing machine, Hair picker	2

Paint Shop.

1. 2.	Paint mixer, Brass polishers	2

Transfer Table.

2.	25 H.P. motors	50

Traveling Crane.

	Bridge motor	20
	Hoist motor	20
	Trolley motor	4

Turn Table.

1.	Motor	4

Heating System.

2.	35 H.P. motors	70

Lavatory Hot Water.

1.	Motor	1

Summary of Motors.

	H. P.
Machine shop	179.5
Boiler shop	61.5
Blacksmith shop	47.5
Mill	332.5
Cabinet shop	22
Upholstery shop	2
Paint shop	2
Transfer table	50
Traveling crane	44
Turn-table	4
Heating system	70
Lavatory hot water system	1
Total rated capacity of motors	816

The Engineer—His Place in Society.*

BY JAMES MANSERGH, F. R. S.

Standing here, in virtue of my position as President of the Institution of Civil Engineers to open the first General International Engineering Congress held in Great Britain, I am conscious of owing my elevation to this eminence to the accident of office, and not to personal desert. I feel very keenly that it is an act of the greatest presumption on my part to occupy this position in the presence of the Grand Old Man of Glasgow's ancient university. I desire, therefore, to explain that the position has been forced upon me, notwithstanding my earnest remonstrance, and by the desire of Lord Kelvin himself. My words will be few, and will be restricted to tendering a very cordial welcome to all engineers—especially to those hailing from foreign and distant lands; to thanking the authors of the papers contributed to the various sections; and to making the briefest reference to certain matters of interest to us, as engineers working under modern conditions.

*Extracts from the President's address at the International Engineering Congress (Glasgow), 1901.

It has long been impossible for any individual to give adequate expression to the fulness of the combination of contemporary science, art, knowledge, and practice which we recognize for engineering. Engineers constitute more than a profession; they amount to a "race;" and it is upon them, more than upon any other class of the civil population of the world, that falls the heaviest share of the "White Man's Burden." There have been framed many definitions of engineering and of the engineer, but none that I can esteem adequate, and at the same time sufficiently exact and exclusive. My reason for holding this opinion is based on two considerations. The first is the persistence of much popular ignorance of the nature of our work, and some lack of appreciation of our class; and the second is the stubborn refusal of the English spirit to admit the necessity of any formal qualification on the part of those who claim to be of the profession.

With us an engineer may hold a diploma, or he may not. He may be associated with our Institution, and be entitled to append a string of capital letters to his name, or he may not possess a single title to command distinction. This is because engineering with us does not consist in *being*, but in *doing*. The public's unformed, vague idea of an engineer is that of a man who can *do* things—a great and constantly increasing number of things—all falling within a wide but fairly recognized category. His quality seems to lean more to the side of invention than to that of scholarship. For my part, I am content to have it so.

Not that an engineer can ever be too deeply instructed, or too well trained in all the elements of knowledge and skill required for the effective pursuit of his calling; but the really great engineer is *born*, not *made*. So subtle is the influence of words upon thought, that I could wish the name of our avocation were spelt in English, as it is in languages of more pronounced Latin derivation, with a capital "I," instead of "E"; "Ingeniering," say, in place of "Engineering." Thus the nature of our work would be better recognized among the people, who are careless of etymologies. The suggestion of the name would be removed from association with the word "engine" (a good enough word in its degree, and one that once had a wider significance than is now left to it), and would be placed where it rightly belongs, with the root idea which gives us the words "ingenious," "ingenuity," etc.

We must, however, go no further in this direction for the missing definition of engineering, or we shall get into the clouds, where, although I am not sure but that we might find some Colleges of Engineering, we should miss the substance of the thing itself. For engineering is the only high art which depends as much on its cheapness for its excellence as upon any other item in the sum of achievement. All other things being equal—adaptability, soundness, efficiency—the engineering work which costs the least money is the best. I do not know of any other product of man's creative and adaptive powers, of which the same can be so truly said. The "cash" basis is the real foundation upon which the engineer builds, and this consideration draws us at once from judging engineering as merely something cleverly done by an ingenious person. It also very often serves to distinguish between college, text-book, or rule-of-thumb engineering and the real thing.

There is an American definition of an engineer which states that "he is a man who can do well for one dollar things that anybody could do somehow for double the money." This is getting very near the truth. It is not the whole truth, of course, but that, for reasons I have already indicated, is unattainable. At any rate, it places in due prominence a quality which those who regard engineering studies from the college standpoint are apt to ignore. I have heard a legend of a professor of applied mechanics who was shocked at the thought of steam engines being made for money to sell—like cakes. A good deal of wasted ingenuity would be saved if those who engage in every kind of engineering work would remember to use the money standard, as well as the foot-rule and the higher mathematics.

Real engineering must be mastered as it is realized on works in progress. It has no authoritative text-book. The working engineer's library is sometimes largely composed of ephemeral manufacturers' catalogues, and lists of prices current of materials. Like the perfect artist described by Longfellow, the engineer must learn to work with the means that lie readiest to his hand. He must cherish his ideas or he will sink into the routineer, but he, of all men, cannot afford to indulge in hobby-riding. He leaves as little as possible to chance, and, if he is wise, he will not rely upon his best mathematics any further than he can see them. If he starts with aptitude, plods on with patience, observes with insight, records with careful exactitude, and adapts with wisdom, in the fulness of time he will find himself, almost to his surprise, in possession of *judgment*, and that is the glory of an engineer, fitting him for his highest employ as man-of-all-work of civilization.

The engineer must have great power of concentration. His solicitude is to make every job a little better than the last. The newest steam engine shows a fractional economy of steam; the latest steamship carries her freight with a scarcely distinguishable saving in coal consumption *per ton*; the selected railway metal lasts a little longer than the previous purchase; the main line is straightened here and there; and, incidentally—as it were—the remote ends of the earth are brought closer together, and plague, pestilence, and famine are driven back.

The wiseacres who declare on political platforms that the effect of modern civilization is to make the rich richer,

and the poor poorer, forget all about engineering. The engineer is the chief of the modern democratic Civil Service. Civilization is admitted to have had its birth with the Romans, and they were the first to recognize a change of purpose in engineering from the idle aims of Egyptian pyramid builders to the useful purposes of road-making and the provision of ample supplies of pure water to their cities. Down to the dawn of the century that has just closed, civil engineering did not surpass the works of the Romans, which, indeed, in some respects remained unequaled. It may be said with respect to the elemental need of the modern world for improved means of transportation, that the new civil engineering first broke out its own line with the notable discovery of the Scotsman, Macadam, that good roads could be made with stones broken small.

The distinguishing note of modern engineering is that it subserves in the main the interests of the mass of the people. The greater comfort, better feeding, higher healthfulness, freer movement of the people to outside the congested urban areas to-day, as contrasted with the state of the populace of this and other countries a century ago, are chiefly attributable to the triumphs of our professional work.

An alarm has been sounded in our ears of late, warning us that we, the inhabitants of the United Kingdom of Great Britain and Ireland, have touched our high-water mark in respect to the prosperity derivable from the prosecution of those manufacturing industries which are based upon engineering, or served by it with the means of transport and communication. This may be so. Our nation has no royal secret for arresting the revolution of Fortune's wheel.

When merchants first sought our shores to trade with the aborigines, their attraction was the native tin. The development of the country, however, was not arrested by the substitution of iron for bronze implements and weapons. Wool became in turn the staple product of the land, and carried its diversified fortunes bravely down almost to within living memory. We have long ceased to produce enough wool, or corn, or meat for our teeming population. It is almost as much as we can do to find enough water to drink. The wisest man that graced the Court of the British Solomon who first united the kingdoms of Scotland and England, would be sorely puzzled—if he were to revisit this realm—to understand how we all contrive to live. The industrial development of the world has proceeded along the lines that the profoundest mind of the nineteenth century—Charles Darwin—traced for the life history of the planet. The course of economic progress is from the simple to the complex, from one-ness to infinite differentiation. In the history of Britain, the mining of a semi-precious metal for exportation was succeeded by pastoral pursuits, and these again were followed by agriculture and manufacturing enterprises. Good government kept order in the land, and saved it from devastating invasions. Margins realized over the cost of living formed capital, which went into fresh enterprises at home, and eventually into adventures for the conquest of markets abroad.

All the time engineering dogged the way, making roads and inland waterways and harbors, and supplying tools and mechanical motive powers. A vast multiplication and diversification of employments for money, ingenuity, and toil has resulted from the free play of the national genius, and been carried to such a height by the indomitable spirit of the race, that now the waxing and waning of particular trades and interests from accidental influences does not alter the balance of the great account which the nation has opened with Fate. . . .

The question of moment to Britishers is: Shall we maintain our ground; to say nothing of increasing our lead? I cannot tell; but this I do believe, that the character of the future of the country, and the fruitfulness of our common calling, depends chiefly upon the preservation of that freedom for the play of all the talents, all the energies, all the force of human [illegible]tion of the powers of nature, and their direction in the service of mankind, which has enabled us to do so much in this regard in the past.

Favored simply by secured peace at home and the confidence of the masters of accumulated capital, engineering has showered its first fruits over our land. To-day these advantages have become internationalized. . . . Science knows no frontiers. The engineer is the truest free trader. He goes whithersoever he is wanted and finds most to do. Will he in future flourish best in Britain, or abroad?

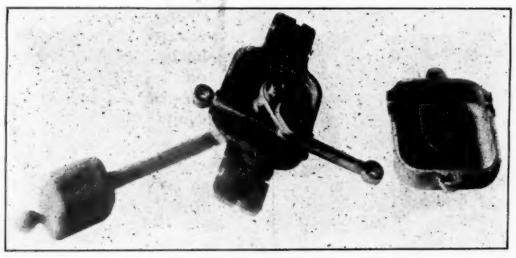
One hears much talk nowadays about the British need for more technical education for workers, and of better instruction in the art of living for the people generally, and I am not disposed to disparage this desire for more light. There cannot be too much of it. Nevertheless, I hold liberty to be more precious than learning. The fullest freedom for the exercise of the inborn spirit of initiative, enterprise, and adventure is the next essential to the occurrence of this spirit in the individual members of a race, for the whole to make headway in the universal struggle for life and a leading position.

I fear that only too good a case could be made out for the allegation that a mistaken statutory system has discouraged in this country—for the time being, at least—the naturalization and development of electrical engineering on the largest scale. In other words, the Electric Lighting Acts had the broad result of chopping up the business of electricity supply in this favored land into morsels reduced to the parochial needs of local authorities. There was no freedom in the business. Instead of the electrical and mechanical development of lighting and power plant being undertaken in this country upon a scale proportional to its early promise, the work had to be done by "sample"—every small specimen differing from the others. Long years passed before any English engineer was in a position to give out an electrical power contract amounting to £100,000. Meanwhile our friends in America and on the Continent of Europe were forging fast ahead. So we lost our chance, and shall probably have to take other people's electrical plant for some time, instead of striking out our own leading line, as our less governed forefathers did in railway work and shipbuilding years ago.

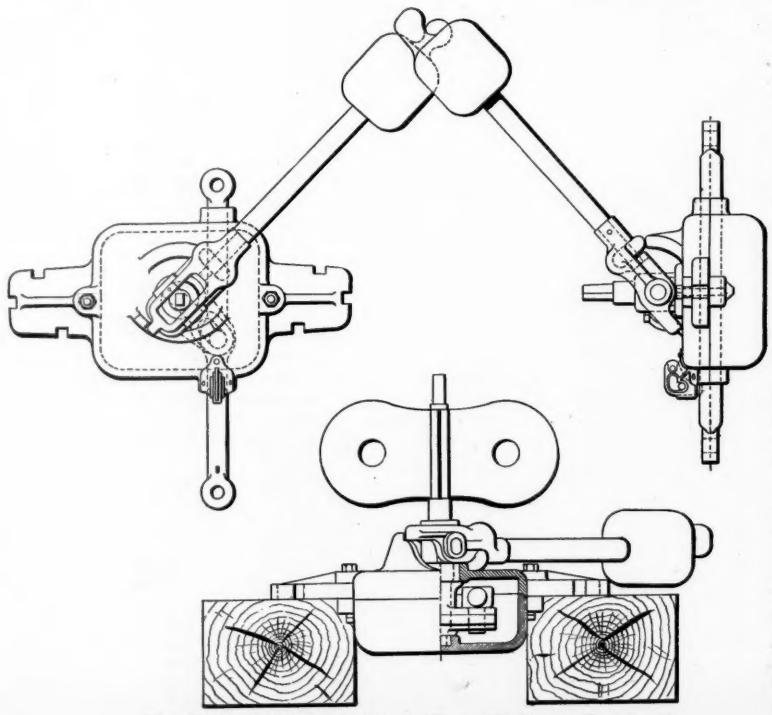
I should like to remark here, in parenthesis, how much of the real essence of economical engineering is contained in the work of settling standard sections of important constructive materials. This matter has been taken in hand by a joint committee of the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Naval Architects, and the Iron and Steel Institute. It is my privilege to be *ex officio* Chairman of this Committee, and we have already taken the evidence of representative men among makers, merchants and users of steel and iron bars of all shapes and scantlings, and received many written communications, all of which go to prove the great desirability of doing very thoroughly the work of standardizing which the Committee have taken up. Sir Benjamin Baker, with a specially selected Sub-Committee, has charge of bridge and general building construction; Sir John Barry, with similar assistance, of railways; Col. Denny of shipbuilding; and Sir Douglas Fox of rolling stock. In the hands of these eminent engineers you may rest assured the work will be well handled; but we desire very earnestly the active and cordial assistance and co-operation of all our brethren interested in this important matter.

A New Yard Switch-Stand.

The Drexel Railway Supply Co., Fisher Building, Chicago, has recently put a new yard switch-stand on the market, designed and patented by Mr. George L. Mansfield. The accompanying engraving makes clear the construction, which is simple and such that the cost of the stand will be low. It will be seen that the stand is automatic and positive in its action, and that the switch bar is directly connected with the operating lever, no gears or pinions being used. The height of the stand above the ties is said to be less than any now in use. The parts are encased in a water-tight shell to prevent freezing in winter and further to keep dirt from accumulating around the moving parts. The stand throws easily, there are few pieces and these are not complicated. The design has been worked out carefully by Mr. Mansfield to meet the requirements of a low switch-stand.



Interior View of "G. L. M." Switch-Stand.



The "G. L. M." Switch-Stand—Drexel Railway Supply Co.

Increased Efficiency in the Air-Brake System.

In the *Railroad Gazette*, April 27, 1900, p. 266, appeared a record of tests of air-braked trains on mountain grades, in which the pressure retaining valves were given especial attention and their action tabulated. Speed, brake-cylinder pressures and train-line pressures were shown graphically from charts of the recording gages. From the proceedings of the Central Railway Club, January and March, 1901, we take some extracts that may be considered as supplementary to the matter published earlier, and also offer some comment editorially.

At the January meeting the following letter was received from Mr. C. H. Quereau:

I have read the discussion of Air-Brake Efficiency before the Central Railway Club, at its November meeting, with considerable interest and profit, and have ventured to assume that you will be interested in a recent experience which has some bearing on the question.

A runaway of a freight train on a 3 per cent. grade, some five miles long, led to an investigation of the facts and cause. It developed that the train first got beyond control soon after tipping over the summit, and the efforts of three trainmen and the two enginemen, after all was done with the air-brakes and sand lever that could be, failed to stop the train till a comparatively level flat was reached. The speed of the engine was such that twenty-four 85 lb. steel rails were broken in 27 places. Fortunately this was the extent of the damage.

There were ten cars in the train beside the caboose; eight equipped with air-brakes, the other two having train pipes and hand-brakes only; so far as the inspection showed the hand and air-brakes were in good condition, the piston travel varying from 5 in. to 7 in., the travel having been adjusted just before reaching the summit of the hill. I should have said that the *usual* inspection showed the brakes to have been in good condition, with the understanding that the usual inspection does not include an examination of the retaining valves.

The investigation included an inspection of the retaining valves, which disclosed the fact that three of them leaked off inside of half a minute. In all probability, had the retainers been in good condition, the runaway would not have occurred, as the train attained such a speed just after the air-brakes were released the first time after tipping over the summit, and were being recharged, that it got beyond the capacity of the hand and air-brakes to control it. Had the retainers been in good working condition, it is more than probable the speed would have been kept down so that the coefficient of friction of the shoes on the wheels would have been sufficient to have enabled the crew to have held the train.

An inspection of the retainers developed many evidences of the failure of the owners of the cars to appreciate the importance of this device and the necessity of its careful inspection. The retainers had been originally fastened to the ends of the cars with ordinary screws, instead of with lag screws; the screws had worked out and been replaced with wire nails, too small to fill the holes in the casting. The inevitable consequence was that the retainers had rattled and vibrated till the couplings and union had sprung aleak, allowing the exhaust from the triple to escape to the atmosphere almost as rapidly as though there had been no retainer. The pipe from the triple to the retainer was not fastened to the car except at the two ends, so that there was possibly ten feet of quarter inch pipe free to vibrate with the swaying and jarring of the car, which no doubt assisted in destroying the usefulness of the retainers.

I have called attention to this case, because I have become impressed that a proper inspection and care of the air-brake to keep it at its proper efficiency should include the retainers, and that this device, in common with the hand-brakes and running board, and probably for the same reasons does not receive the attention and consideration it should.

Mr. West.—I should like to get a little information on this matter of retainers. We recently had a train get away on a five-mile grade and the question was raised by the division superintendent as to how long a grade or how steep a grade should require the trainmen to turn up the retainers? I should like to ask Mr. Hutchins to inform us on that.

Mr. Hutchins.—I would say that on any grade that is steep enough to require the use of all the air-brakes to hold the train continually while on the grade the retainers should all be used.

Mr. West.—No matter how long, how short the grade?

Mr. Hutchins.—If the grade is three miles or more in length, that would depend a good deal on the judgment of the trainmen. A train could hardly get away from an engineer on a grade of one or two miles. But where it runs three to five and longer, it is necessary to make the second application of the brakes.

Mr. West.—My judgment in the matter was that it was not necessary, on that short grade, for the trainmen to do that. It seems to me if on every little grade we have the trainmen have to go over the train and turn the retainers and when they get to a little level spot go back and turn them up we may as well go back to the

chain brake. I think there are more trainmen at present injured running over the trains than there are applying the brakes. The circumstances in our case were these: The grade was about five or six miles long and about a mile and a half from the summit there was a very high trestle and there was a standing order that trains should be brought down to, I think, about an eight-mile gait. The engineer claims that he applied the brakes and the train was brought under good control approaching this trestle. About a mile and a half below the trestle was a station, and he claims he applied the brakes there and they took hold all right, apparently, and at the foot of the grade we have a junction with the West Shore Railroad, which is a very important junction point. When he undertook to apply the brakes to make the stop for the junction at the signal, he could not do it and he ran down and struck a train standing there. The trainmen did not make any claim to have done anything with the retainers whatever, and, of course, the engineer claimed that if the retainers had been operated he could have held the train.

That was my object in asking the question. I furthermore want to say that the whole time consumed in covering this distance wasn't to exceed 12 minutes, and it seems to me that if a man has a full pressure of air at the top of a grade five or six miles long and 70 ft. to the mile, to cover that distance in 10 or 12 minutes it ought not to be necessary to manipulate the retainers.

Mr. Rosevear.—A great deal that is found fault with in the efficiency of air-brakes is due to the carelessness of enginemen. There is another point in connection with the gentleman's letter, in which he (Mr. Quereau) said that the hand-brake had been used as well as the air-brakes. It seems to me that if the hand-brakes had been used on the caboose and two cars, there would certainly have been force enough to at least hold the train while the engineman released, charged and again applied the brakes. I wonder how many foreign cars were in the make-up of this train. In the short time we had to equip the cars with air-brakes we were not able to provide the necessary facilities for testing and keeping them in order, and it is only just now that railroads are being equipped with testing plants outside of terminals. From now on I have no doubt the air-brake equipment will be in much better condition than it is at present. A train of 10 cars with eight cars air-braked getting away on a 3 per cent. grade is, I think, somewhat exaggerated.

Mr. McCarty.—The point regarding the report of the Denver & Rio Grande, as to the use of hand-brakes on the cars, is pretty clearly set forth by the writer in that it applies only to the two cars that were piped and not to the air-brake cars. It seems to me, in my past experience, that the retaining valve is practically in charge of trainmen, brakemen or conductor.

Mr. West.—We have about half of our own equipment fitted with air and our trains are made up in about that proportion, as near as possible, and our practice has been and is to-day that the trainmen shall set up a certain number of hand-brake cars in proportion to the air-brake cars in the train; what I will call a gradual, an ordinary pressure; not enough to slide the wheels but enough to take care of the cars without brakes being let off. That enables the engineer to pull a train over a trestle, as I mentioned, or a little level spot in the road without the necessity of the trainmen going over those cars and letting off the brakes; then it depends upon them to manipulate the hand-brake cars to take care of the train over the steeper portions of a grade. I do not know that I have made the condition plain, but as it occurred to me, the engineer lost his air by making two or three applications, in the case of ours, and when he got down to the foot of the hill he had no air to apply. Of course, we don't know that was the condition, but that is my impression; the application of the air at the trestle and again at the second station; that he was not careful enough to know whether he was accumulating any air between that and the time he wanted to make the final application, and he had been relying on the hand-brake cars to hold it, and when the emergency came he didn't have the air to apply, and that is the point I would like to have brought out. The trouble we are having now is a lack of understanding between the trainmen and the enginemen. We are on a road of heavy grades and we have had three quite serious runaways, and I believe in every case it has been where the air has all been exhausted before the emergency stop should have been made.

From Circular No. 31, D., L. & W. Railroad "Instructions for Testing and Handling Air-Brakes," paragraphs No. 3 and No. 4, are given as applying to yard and summit tests of freight trains:

"3. When the brakes have been applied, the Car Inspector will start on one side and a brakeman on the other side, and go from the engine to the last air car, examining all brakes and seeing that pistons do not travel more than 7 in. nor less than 5 in. During this same time another brakeman must start from the engine and go over the top of the cars and turn up each retainer. When the last air car is reached and the brakes on each car found to be in proper order the prescribed signal will be given the engineman to release brakes. When the air on the last car has released to a point where the retainer closes, the car inspector on one side and a brakeman on the other side of the train will go to the engine examining all brakes to see that they properly release and that there are no leaks. The brakeman on top of the train will go to the engine turning down the retainers on each car. The three men should be acting together on each car.

"4. Before starting down the hills at Dansville, Clarks Summit, Lehigh, Pocono, Port Morris, Apulia, Paris, Summit on Ithaca Branch and hills on Montrose Branch this test must be made and the conductor and engineman must know by signal that all retainers are turned up. If the retainers, when they are all up, cause too much braking power, turn enough of them down to let the train proceed under control of the engineman."

Mr. Fergusson.—The test given in those instructions is an elaborate test that takes 15 or 20 minutes. You cannot, of course, be too careful with your air-brakes. But I think that the test which is given in those instructions is too elaborate to make every time a car is cut out on the road or a hose is disconnected and nothing else done to the train. I think that perhaps another simpler test would be just as effective.

Mr. Langan.—At all our terminal stations this test is lived up to. We are having a little trouble with trainmen. They refuse to turn up the retainers and go over the train to assist the inspectors, unless I happen to be on the ground. That will come around in time. But every time there is a break-in-two, disconnection or bursted hose or anything of that kind, we don't mean when on the road to make the retainer test.

What is the idea of making a retainer test after you have made it at the terminal point? The idea is this: Our fast freights, running from Hoboken to Buffalo, or Buffalo to Hoboken, were to make the test at Hoboken coming west and at Scranton. If we had to delay our trains to get the train in shape Hoboken was to do it. We know that different things arise in a travel of 145 to 150 miles, but it was not meant that the retainers should be tested. Suppose we burst a hose going up hill. We do not want to make a test, there on the hill, of the retainers, or anything of that kind. That was not meant in that way. The men have been instructed simply at terminal points. Locals and pick-ups are not supposed to handle their trains by air. If there are any cars next the engine, they are coupled up but they are not supposed at any time to switch all their air cars together, it being understood that they handle their trains by hand.

The Struggle for the Line from Salt Lake to Los Angeles and San Diego.

There is reason to believe that the Oregon Short Line will have its road in operation to Los Angeles by Oct. 1, 1902. By the present route and the proposed extensions this line can secure a line to Southern California with the following distances: Salt Lake City to Los Angeles, 820.5 miles; San Diego, 947 miles. The grading to be done from Pyper, or Calientes as it is now known, to the Southern Pacific tracks between Beaumont and Banning is 403.8 miles. The total Short Line, Utah & Pacific and Southern Pacific, tracks now in operation are 376.7 miles; grade complete with track laid from Utah State line to Calientes, 40.2 miles. Grade to be built, 403.6 miles. Total, 820.5 miles, Salt Lake to Los Angeles.

In 1889 the Union Pacific (that branch now known as the Oregon Short Line) built about 155 miles of grade, below Milford, Utah, with the expectation of a California extension. In 1895-6 the Utah & California, now the San Pedro, Los Angeles & Salt Lake, secured the right to build over the abandoned grade, and maps were filed in the land office at Carson City, Nev., to that effect. In 1898 the Oregon Short Line built from their terminus at Milford, Utah, to the Nevada state line. In 1899 following the announcement of J. H. Long, of the Southern Pacific, who had jumped the grade by running his surveys over it, the Short Line, to regain possession of it in Lincoln County, Nev., and hold it, incorporated the Utah, Nevada & California road and filed papers at Carson City to that effect.

In 1900 the San Pedro, Los Angeles & Salt Lake Railroad was organized and proposed to use the grade built by the Short Line in 1889. The first hearing came up in the courts at Carson City; the question was, whether this road had the right-of-way on the Short Line grade. Register O. N. Gallop and Recorder D. H. Hall, of the Carson City office, rendered their decision to the effect that the claim of the Short Line and the Utah, Nevada & California were without merit; the rights of the former having been forfeited on account of non-payment of taxes. They recommended that the maps of the route filed by the Utah, Nevada & California in 1899 be rejected, and the maps filed April 27, 1897, by the Utah & California, or San Pedro, be approved and that company be given title to the right-of-way. This decision prevented the Short Line from extending beyond Uvada, until the Land Office Commissioner gave his decision and matter was finally decided.

On April 5, 1901, Vice-President Bancroft of the Short Line returned from New York where he had been in conference with President Harriman and others, and ordered construction to commence at once of one mile of track from Uvada across the state line into Nevada. This was built in order to hold the right-of-way. This mile of track was laid in violation of the decision given by the Land Office at Carson City. At this point Mr. Whittemore, of the San Pedro Company, went to Nevada to secure an injunction against the Short Line to prevent the latter laying any more track on grade. Whittemore proceeded to Uvada with a small gang of men and teams, to work on the contested grade at the state line. When the Short Line men arrived they forced his men to retire. Upon his return to Salt Lake a small gang of men were sent down to resist the Short Line forces, who still remained at the front, working night and day.

The grade after 11 years was in good condition. Below Uvada there were many dry washes which had to be bridged, three requiring long and high trestles. Ties and rails were rushed to the front by the Short Line, and every siding south of Juab was being filled up with material. Five miles from Uvada is the horse-shoe curve, in the middle of which was a large gulley. The track here was "cribbed up," after which came a bridge gang and the bridge was made standard. The work of the Japanese laborers was surprising; they moved as if by clockwork, and were very intelligent.

The bridge over this gulley was completed April 15. Beyond this point the work was easy to Crestline, which is 6.7 miles from the state line. Here a siding 1,500 ft. long was put in and the entire working force moved to this point.

This is at the rim of the Salt Lake basin and the first station south of Uvada. From Crestline it is 5.9 miles to Tunnel No. 1. The Clark (San Pedro) forces were camped in a rock cut a short distance from Tunnel No. 1, and also had possession of Tunnels 2 and 3. The Short Line people had their camp at the mouth of Tunnel No. 1, which they held, as well as Tunnels 5 and 6. The San Pedro had secured possession of a big cut east of Tunnel No. 1. The Short Line placed men inside the tunnel for the purpose of holding it, and the aim of the Clark men was to prevent the Short Line from re-entering from either portal.

In one week the Short Line had made a record in

The Contested Line—Utah to the Southern California Coast.

railroad building. Five miles of track had been laid and surfaced; two long and high trestles built, ties distributed by teams as far as Tunnel No. 1; and material enough was on the ground to complete 100 miles.

The following figures give the elevation and distances from Milford to this point: State Line between Utah and Nevada, 74.7 miles from Milford, elevation 5,685 ft.; summit or rim of Salt Lake basin, 81.4 miles, elevation 5,991 ft; Tunnel No. 1, 278 ft. long, 87.3 miles, elevation 5,715 ft.

On June 24, a very important suit between the Short Line and the San Pedro Company, involving the right-of-way over which the former company had been building their lines, came up in the U. S. Circuit Court at Carson City. The question was: "Shall the injunction granted in April be dissolved, restraining the Clark Company over the Uvada grade from the Utah line about 40 miles in Lincoln County, Nevada?"

After a two-days' trial, the court sustained the injunction in favor of the Short Line, for the 40 miles of road in Nevada, from the state line at Uvada to Calientes, but not sustaining as to the remainder of the route pending the decision of the contest as to maps and documents that were filed in the Land Office at Carson City. After this decision the Clark forces gave up the struggle, leaving the Short Line to build on to Calientes.

The work of track laying was rushed forward, including repairs to tunnels, of which there were six, with a total length of 2,235 ft. They are all within a distance of 16.5 miles, No. 1 being at mile post 87.3, No. 2 at post 100.6, Nos. 2 to 6 within a distance of 3.2 miles. All the tunnels will be lined with corrugated iron to protect the timbers from fire. The timbers, after 11 years, were found to be in perfect condition, many of them looking like new lumber. The Short Line had 12 miles of track constructed, and on July 30 had completed the 41 mile section of the new Los Angeles line as far as Calientes. The distances from Tunnel No. 1 are as follows: Tunnel No. 2, 239 ft. long, 100.6 miles, elevation, 5,202 ft.; Tunnel No. 3, 350 ft. long, 101 miles, elevation, 5,171 ft.; Tunnel No. 4, 202 ft. long, 101.3 miles, elevation, 5,141 ft.; Tunnel No. 5, 639 ft. long, elevation, 4,915 ft.; (Tunnels 3 to 6 on a 2 deg. grade); Calientes, 114.9 miles from Milford, elevation, 4,422 ft. This is the end of the

(*Continued on page* 640.)

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

For three years past the Western Railway Club has furnished its members bound volumes of the Proceedings at the end of the year in addition to sending out the usual reports of the meetings in pamphlet form. This puts the year's work in convenient shape for reference and further the books are furnished to members without increasing the regular club dues. Each year a new lot finds that these bound volumes cost non-members $2 each, or the price of a year's membership. The result is that many who would buy the Proceedings for reference only, become members, the cost being the same, and take an active interest in the club. Possibly this has had as much to do with increasing the membership of the Western Railway Club as any one factor, and it would seem to be a practice that other railroad clubs could adopt to advantage. The officers of the Western Railway Club take the position that a man who wants the Proceedings for reference is a good man for the club, and the plan of furnishing bound volumes to members without charge has been very successful in getting these men in as members. We believe the same plan will be followed this year.

The Air-Brake and the Retaining Valve.

The air-brake as a part of train equipment is not now undervalued. The braking requirements of train service are more exacting than ever before, and will become still greater as time goes on. We recently commented on failure to maintain the brake equipment as a whole, and now refer to the retaining valve in particular and the care it has thus far received.

The office of this valve and the working of the valve itself are so well known as to need no explanation here. On some lines retaining valves are considered a useless attachment. On a few roads with heavy grades they are considered a very important part of the brake equipment, and in trying to keep the retaining valves of foreign cars in working order a heavy burden is put on these roads. It would facilitate matters if each road would keep the retainers on its own cars in working order.

Recently there has been a disposition to treat the retaining valve more seriously, as in this year's proceedings of some of the railroad clubs, the Central Railway Club having followed the subject most perseveringly. Some extracts of the Central Club's discussions are given elsewhere in this issue. From the trend of questions asked and answers given in the course of discussion, it is apparent that on freight trains the use of the retaining valve has been desultory. Numerous instances are recorded where insecure fastenings and careless location resulted in leaks in the pipe fittings and nullified the holding effect of the retaining valve. In other cases, the question arose as to how long and how steep a grade, and what length of train justified turning up the retainers and again releasing them. This had never been generally ruled upon, and it was frankly conceded by some that there was no fixed rule. It was also admitted that there was difficulty in getting trainmen to take the trouble to use the retaining valves. There are those who assert that even on roads having very steep and long grades the pressure retaining valves are quite generally disregarded on freight trains, and that the "pick-handle" in the brake wheel is often the controlling factor while recharging auxiliary reservoirs on heavy grades. A little careful observation tends to strengthen this assertion. The pick-handle, in the hands of a husky and attentive brakeman is a powerful factor of safety in descending grades, but this implement in its primitiveness makes a sharp contrast with the high development of automatic parts of the air-brake.

The foregoing statements outline a surprising condition. The retaining valve is a simple and effective device capable of doing all that it was designed for. It should be well maintained, properly located and used, or it should not be depended upon by officials as a factor of safety in mountain work, while it is largely ignored by trainmen. It is useless to talk of discarding it. If in its present form, suitable only for hand manipulation, it is too troublesome, it should be developed into an automatically controlled part of the air-brake equipment. Several unsuccessful attempts have been made to do this, but a recently completed device is said to work satisfactorily. The results of tests have not yet been made public. Information may be given later.

It is true that going over a long freight train to turn up the retainers, and again to turn them down, involves an outlay of time that is sometimes prohibitive. This is the strongest argument for automatic control from the engine, but certainly it should not be construed as an argument in favor of the disuse of a device so valuable as the retaining valve. The proper thing would seem to be for each road, on its several divisions, to establish reasonable rules for the use of the retainers; to see that those rules are observed, and that the retainers are not allowed to become inoperative.

There are now in use some simple and successful devices for automatically retaining the brakes on the locomotive only, one of these being described in our issue of Aug. 16. The purpose of such control is aside from the main issue of the use of retaining valves on trains. To be able to retain the driver brakes while all the train brakes are put in full release will avert many break-in-twos of freight trains. Holding back the engine when it is desirable to make a release on a train just before coming to a stop; or to release and pull on into a siding after braking almost to a stop, avoids the lurching ahead of the engine which is the commonest cause of breaking in two, both under the conditions given and in running over sharp dips and grades at speed. One advantage of the latest driver brake retainers is that they are automatic without complicating the driver brake equipment. This use of the retaining valve on locomotives has long been appreciated by progressive locomotive engineers and the valve as a hand-operated adjunct has thus been used for some years, but not commonly. It is a time and money saving help.

Bridge Metal and Bridge Tests.

At the International Railroad Congress, held last year in Paris, an important report on bridges by Max Edler von Leber was presented and discussed. This report has just appeared in English in the August number of the *Bulletin* of the Congress, where it covers 237 pages, and we here give a synopsis of its contents and conclusions. The two questions discussed in the report are the following:

A. What quantities of metal are used and ought to be used in railroad bridges according to the regulations in force in different countries?

B. What are the nature and value of the methods adopted for the initial testing and for the subsequent periodical testing of metallic bridges? What is the real value of these tests, and can they be regarded as a practical means of establishing the actual conditions of stability and the margin of safety of such structures?

These questions were proposed and briefly discussed at the London Congress of 1895, and the present report is the result of the labors of Von Leber in digesting later information forwarded to him in response to circulars of inquiry. Of the nine points concerning which he asked information, four related to the live loads employed in computing stresses, three to the allowable unit-stresses used in designing, and two to tests made after erection. Sixty responses were received from 24 different countries, of which nine were from the United States, and these are tabulated in a very clear manner, the metric system being used throughout.

The report opens with a brief history of metallic bridges up to 1870, at which date the present forms of trusses and general methods of computation began to be used. Next follows a chapter on the increase in weights of locomotives, with diagrams of wheel loads used in Europe and America in 1899. The regulations in force in the various European countries concerning the live loads to be used in the computation of stresses are then reviewed at length. At first there were no governmental regulations regarding this matter, as there are now none in the United States, but such were established in Austria in 1870 after the Czernowitz bridge accident, and in England in 1881 after the Tay bridge accident. France issued such regulations in 1858, in 1869, in 1877, and again in 1891. The Russian regulations of 1884 are said to be very complete, as they give not only the wheel loads but also the equivalent uniform loads for both moments and shears in different parts of the span. Typical locomotives are not regarded with favor by the author, for an actual lighter locomotive may sometimes produce higher stresses; consequently, he advocates the plan of using uniform loads which produce stresses equal to actual wheel loads. The heaviest locomotives and trains are those of the United States, and here, says the author, nothing definite is likely to be fixed regarding live loads, whereas with the lighter trains and more fixed traffic of Europe it may be possible to come to a satisfactory understanding, particularly on the great international lines. In concluding this branch of his subject the author devotes some 30 pages to those methods of computing stresses that he advocates, giving tables by which equivalent uniform loads may be found for different trains having weights of locomotive and tender varying from 155 to 86 metric tons.

The kind and quality of bridge metal next receive attention. Bessemer steel is not allowed to be used for bridge structures in Austria, but it may be employed in France and North Germany, provided it satisfies the prescribed tests. Wrought iron is going out of use. Medium or mild open-hearth steel appears now to be mostly used for European bridges, as it is for those of this country. For large structures steel of a high ultimate strength should be used in order to decrease the dead load; for those of small span a softer quality is more advantageous. The product of the ultimate tensile stress by the ultimate elongation should be approximately constant, in the opinion of the author; thus the French specifications require ultimate elongations of 28 and 22 per cent. for ultimate strengths of 35 and 45 kilograms per square millimeter (50,000 and 64,000 lbs. per sq. in.), the products being 9.8 and 9.9 in the two cases. This product he calls the "coefficient of quality," but according to American ideas it is more properly a coefficient of resilience, as it is a rough measure of the work required to cause rupture.

The allowable unit-stresses to be used in designing bridge members, as fixed by law in European countries are recapitulated in Chapter V. Such working unit-stresses depend upon the quality of the metal, upon the range of minimum to maximum stress, and upon the fact whether or not the stress is uniformly distributed over the cross-section. The formulas of Launhardt and Weyrauch for repeated stresses appear to be widely used, but these do not take into account the length of span, which is an important element, for it has been recognized from the earliest times that short spans should have lower working unit-stresses than long ones. The extreme limits in tension usually vary from 6 to 9 kilograms per square millimeter (8,600 to 13,000 lbs. per sq. in.) for wrought iron and from 6.5 to 12 kilograms per square millimeter (9,300 to 17,000 lbs. per sq. in.) for mild steel, the lower values being for the longest spans. To take into account the range of stress and alternate stresses of tension and compression the author recommends for steel the formula

$$S = 9{,}700\ (1 + \tfrac{1}{2}\,R)\ (1 - \tfrac{1}{2}\,r)$$

in which S is the working unit-stress in pounds per square inch, R is the ratio of dead to total load, and r is the ratio of the least unit stress of one kind to the greatest of the other kind. Here $r = o$ for the usual case where the stress is always tension or always compression, and the formula reduces to that of Launhardt. For stresses ranging from tension into compression or the reverse the formula does not seem to be a logical one, and it is but little known to American engineers.

The quality of metal used in a bridge depends upon all the preceding considerations. Concerning the weights of existing bridges the author gives tables and diagrams for over a thousand different structures, ranging in span from short plate girders up to that of the great Forth cantilever. Thirty-six of the largest bridges in the world are described with excellent illustrations; among these is curiously included the New Orleans cantilever, the erection of which was never begun. The proper systems of construction for different spans are discussed at length. For spans ranging from 18 to 45 meters he recommends lattice girders with parallel chords and double or quadruple web systems. For spans from 45 to 80 meters the top chord may be curved in the case of through bridges, but multiple web systems should still be used. For spans from 80 to 120 meters double or triple web systems are also preferred, the method of riveted joints being here also used. It need scarcely be said that along these lines the author's recommendations are entirely at variance with American practice.

The final conclusion of the author regarding the weight of metal in railroad bridges is shown by the following extract from his table, which we have translated into the English system of measures, so that the spans

are given in feet and the minimum, mean and maximum weights in pounds per linear foot. These weights do not include cross ties and rails. Presumably the minimum

Spans and Weights Per Running Foot.

Span in feet.....	50	100	200	400	800
Minimum weight	520	730	1,320	2,470	4,530
Mean weight	720	1,200	1,990	3,370	5,800
Maximum weight	930	1,670	2,660	4,270	7,070

weights refer to single track bridges and the maximum weights to double track bridges, but on this point the author is not clear. This table is an interesting one as giving international averages, but its value otherwise is not great. For bridges over 800 ft. in span the data are too few to warrant any exact conclusion; nevertheless for spans of 400 meters (1,312 ft.) the figures collected indicate minimum and maximum weights of 7,200 and 10,500 lbs. per linear foot of span.

The second question, regarding tests of bridges after erection, receives but a slight discussion by the author. It appears that such tests are generally made in Europe before the bridge is opened to traffic and periodically thereafter at intervals of from three to five years. The test generally consists in measuring the deflection at the middle under the passage of a heavy train. In this country tests of this kind are seldom made except immediately after erection. Of the nine American replies to the author's circular four roads state that they use such tests, namely, the Pittsburgh & Western, the Lehigh Valley, the Southern Pacific and the Illinois Central. Of the 51 roads reporting from other countries 49 made such tests either by leveling or by deflection meters, while 11 of these also use strain dynamometers for recording the stresses in the bridge members. The author concludes and the Congress resolved that such tests are indispensable, as they constitute a guarantee of safety to which the traveling public is entitled, but that they should not in any way supersede the necessity for careful inspection and maintenance of the details of the bridge.

An international review of this kind, when well done, is of great value and interest to engineers in all countries. Von Leber has done this work as well as one man can do, and he should receive great credit for the comprehensive and painstaking manner in which he presents such an array of facts and opinions. It is, however, not safe for an International Congress to pass resolutions formulated from the conclusions of one man. Such resolutions should only be enacted after the report of a committee having members in several countries. The conclusions of these members will often be at variance, due to the differences of practice in their different countries, but these diverging conclusions, instead of being disadvantageous, are of great importance and interest, for they result from causes which have valid and substantial foundation in each country. An international review of bridge practice should, in our opinion, consist of the reports of five or six engineers in different countries which are framed on the same plan of inquiry, with the salient points of agreement and difference summarized for discussion at the Congress. Where agreement is found in the conclusions there is no objection to passing a resolution indorsing the same, but where radical disagreement exists in conclusions an average should not be set up to receive indorsement. Von Leber's excellent and exhaustive report is most creditable to himself and to the International Railroad Congress, and may well be taken in many respects as a model for the work of future international committees.

Annual Reports.

Denver & Rio Grande.—The tendency towards amalgamation has affected this property in two directions in the past year. First, control of the road itself, through purchase of something about a majority of the outstanding shares was secured in the open market by the Gould interests in control of the Missouri Pacific. Second, the company bought its Western connection, the Rio Grande Western, which has been used since it was built to complete the route to Ogden. In taking over the Rio Grande Western, the Denver & Rio Grande adds 645 miles to its controlled and operated road by an addition to its outstanding preferred stock of $24,350,000. The terms of purchase include the exchange of $7,500,000 Rio Grande Western preferred, on a basis of 10 shares for 11 shares of Denver & Rio Grande preferred, or $8,250,000 of the latter, both stocks paying 5 per cent. dividends. The $10,000,000 Rio Grande Western common stock which paid 5 per cent. dividends in 1900, though smaller rates in previous years, was bought on a basis of 80 per cent. in cash, which was secured by the issue to Denver & Rio Grande stockholders, at 90 per cent., of $12,500,000 of its preferred stock. Besides the railroad, important fuel properties along the Rio Grande Western were taken over.

This purchase will increase the outstanding preferred shares of Denver & Rio Grande from $23,650,000 to $44,400,000, the dividend requirements of which should be met by the earnings of the purchased property, irrespective of the economies in management expected from joint control. As the absorption will not be concluded until Oct. 1, the Denver & Rio Grande accounts for 1901 are not affected by the purchase.

On practically unchanged average mileage, gross earnings increased by $1,206,300, 11¾ per cent., in 1901, following an increase of $976,000 in 1900, and $927,000 in 1899. Of this gain $568,265 was saved for net, and with only slight changes in fixed charges, the surplus for dividends was $2,053,200, a gain of $558,960 over the 1900 figures. From this balance 5 per cent. dividends on the preferred shares were paid as against 4 per cent. last year. Appropriations to bond refunding expenses, for which $120,000 were deducted from the 1900 income, however, are no longer carried. Deductions of dividend and renewal fund from last year's net receipts left a balance of $730,922, to be carried over to the new account. This was equal to about 2 per cent. on the common shares and is considerably larger than any previous surplus earned by the company.

Last year's improvement in revenues is not only noteworthy in itself, but shows the recuperative power of the road. In 1894, gross receipts fell from $9,317,000 to $6,476,000, and net receipts from $4,036,000 to $2,503,000. This reduction of nearly one-third in gross receipts and of two-fifths of the net income within the year was extraordinary even for that period of falling railroad tonnage and receipts. How earnings have grown since the permanent recovery set in, in 1897, is shown in the following table.

	Miles.	Gross Earnings.	Operating Expenses.	Net Earnings.
1897.....	1,666	6,945,114	4,075,336	2,869,778
1898.....	1,666	8,342,926	5,017,599	3,325,326
1899.....	1,670	9,270,247	5,710,350	3,559,896
1900.....	1,674	10,246,079	6,485,839	3,760,240

Of the mileage worked on June 30 last (1,722 miles) more than half (or 912 miles) was narrow gage, and equipment used in that service still about half the total owned. The company has, however, now 346 miles of the narrow gage divisions equipped with the third rail for standard gage rolling stock, and some of the most important work now going on is the rebuilding of narrow gage line as standard gage, or with third rail. Last year 48 miles was added to the third rail system in the San Luis Valley with the idea ultimately of abandoning narrow gage equipment on this section, and the narrow gage lines have been thus reduced 110 miles in two years.

The Rio Grande, like all other railroads in the United States, needs betterments in permanent way and rolling stock. In the year just past the directors secured from the shareholders authority to issue at discretion $6,900,000 in bonds for capital requirements. This had been reserved in the reorganization plan to build or acquire a line to Ogden, but will not be necessary for that purpose now that the Rio Grande Western is acquired. The assumption is that these bonds will now be available for improvements.

Cleveland, Cincinnati, Chicago & St. Louis.—The report of this company for the year to June 30 last shows the working of three factors which have been prominent in the past year's results of other companies, whose statements have been submitted. There is substantial increase in gross earnings, attributable in the freight receipts more to the better rates than to increase in tonnage. Higher passenger revenues also have contributed a substantial share of the gain in gross. On the other hand expenses have increased in larger ratio than receipts, first, because of increased maintenance cost and betterment charges to that account; and, secondly, through the higher price of coal.

The gain in gross earnings of this company for the year amounted to $1,071,000, following a gain of $2,088,000 in the previous year. Expenses absorbed all but the $64,000 of this gain, as in the previous year they accounted for $1,104,000 of that year's larger income. Gross receipts are now $17,878,000, or $4,760,000 above the receipts of 1897, since which year there has been steady annual growth in income. The surplus over all charges was $2,204,889, substantially the result secured in 1900. Besides the 5 per cent. dividend on the preferred shares, however, 3½ per cent. dividends was paid on the common shares instead of 3 per cent. in 1900. The surplus after this disbursement was $852,917, allowing for miscellaneous income, not derived from operations. Continuing the policy of the previous year, when over $840,000 was appropriated out of surplus income for equipment and other purposes, the sum of $568,000 was appropriated in 1901 for betterments, etc., of which $273,000 was for double tracking; $104,000 for the Anderson yard improvement and $191,300 for 300 new coal cars. In addition to this, the company bought 2,700 freight cars at a cost of $1,501,000, payable in monthly instalments, for five years.

The details of the income account appear below.

	1901.	1900.	Increase.
Freight earnings	$11,640,003	$10,867,502	$772,501
Passenger earnings	4,979,652	4,653,224	326,428
Total gross	17,877,489	16,806,851	1,070,638
Maintenance of way exp.	2,263,379	1,885,560	377,819
Maintenance equip. exp.	2,589,564	2,561,768	27,796
All expenses and taxes..	12,755,638	11,749,264	1,026,374
Net earnings	5,121,851	5,057,587	64,264
Total income	5,249,505	5,140,521	108,984
Charges	2,916,963	2,866,538	50,425
Dividends	1,479,626	1,339,840	139,766
Surplus	$852,917	$934,143	*$81,226
Improvement and equip..	567,852	840,943	*173,091
Balance	$285,095	$93,200	$191,895

* Decrease.

Including the operations of the Peoria & Eastern and other lines jointly owned or worked, the gross earnings of the system of 2,287 miles of main track were $20,465,800, an increase of $1,189,500, and net earnings were $5,947,750, an increase of $8,775,000 as compared with the previous year.

Maintenance included heavier charges than in 1900 for rail and tie renewals, enlarging stations, yards and terminals, strengthening bridges, etc. The new work included 35 miles of yard and passing sidings, 120 miles of 80-lb. rail, 210 miles of ballasting, etc., while $137,309, spent for new shop tools, was also charged against maintenance account.

A change in capital account shows the retirement of $2,000,000 divisional 7 per cent. bonds, and the issue in their place of the same amount of general mortgage 4 per cent. bonds, at a slight premium which was credited to construction account. Peoria & Eastern bonds for $397,000 held in the treasury were disposed of, as they were not needed for controlling that property, the majority of whose stock is held by the Big Four. Their proceeds to the extent of $377,000 were used in buying an interest in the securities of the Cincinnati & Northern, a line from Franklin to Jackson, Ohio, which the Directors consider will be valuable as a feeder, and also as an investment.

Concerning the outlook for the coming year, President Ingalls notes that whereas a year ago, he had to report a failure of the wheat crop along the company's lines, but with a flattering outlook for corn, this year conditions of these cereals are reversed. The harvest of corn in the company's territory, which includes the grain-growing sections of Southern Indiana, Illinois and Ohio, promises a two-thirds crop, while the wheat crop has been immense and is harvested.

Norfolk & Western.—The report of this company for the year ending June 30 last now at hand in advance sheets, makes a record equally favorable whether the increase in earnings, growth of tonnage, improvement of the property, financial strength or progress in efficiency of operation is considered. It is scarcely half a dozen years since the property went into bankruptcy, for the reason that with gross earnings of $10,340,000 (in 1894) on 1,570 miles of road, net receipts at $2,782,000 were not sufficient to pay fixed charges, which were then $3,214,000. The conditions producing those results have been so far left behind that in 1901 gross earnings on practically unchanged mileage of road reached $15,785,442, net receipts were $6,339,983, and the surplus over fixed charges was $4,157,831, as against the deficit of $325,000 reported in 1894 before reorganization. In 1901 alone gross earnings were increased by $1,694,400 and net by $750,000. Just what changes were brought about in the year's revenue results will appear by the following comparison of the income account for 1901 and 1900:

Earnings:	1901.	1900.	Increase.
Miles	1,560	1,552	8
Passenger	$2,046,454	$1,857,304	$189,149
Freight	13,214,163	11,753,062	1,461,101
Total gross	$15,785,441	$14,091,004	$1,694,436
Expenses:			
Main. of way.....	$1,975,393	$1,558,803	$416,590
Main. of equipment.....	2,324,226	2,034,383	289,843
Conducting Trans.	4,417,358	4,210,174	207,184
Gen. expenses and taxes.	728,480	697,734	30,745
	$9,445,459	$8,501,095	$944,363
Net earnings	$6,339,982	$5,589,909	$750,073
Total net income	$6,408,590	$5,663,471	$845,128
Fixed charges	2,250,769	2,274,159	*23,390
Balance	$4,157,830	$3,387,312	$770,518
Pref. dividends	909,924	909,924	.....
Common dividends	644,692	.....	644,692
Surplus	$2,603,214	$2,477,388	$125,826
Better. fund	1,500,000	1,500,000	.....
Flood fund	250,000	.....	250,000
Discounts, etc.	31,185	470,626	*329,441
Surplus	$822,029	$507,938	$314,091

*Decrease.

President Fink gives a table to show the development of revenues since 1898, which was the first full fiscal year of the present company. These figures show a gain in gross earnings in the three years covered of $4,549,319, or 40½ per cent., of which $3,907,264 was attributable to growth of freight receipts. Increase in expenses was $1,559,360, or 20 per cent., an unusually low proportion for the period, compared with the figures of other roads. The increase in cost of transportation was kept down to $442,887. In cost of maintenance the increase between 1898 and 1901 has been $1,028,743. In net the gain for the three years is $2,989,958, or 89 1-3 per cent. The surplus over charges and preferred dividends was equal to fully 5 per cent. on the outstanding common shares of $64,469,000. This showing of net income led the directors, last spring, to begin dividends on the common shares, with an initial payment of one per cent.

Dividend payments of the year accounted for only $1,554,616 of the surplus of $4,157,800, resulting from the year's operations, and the disposition of this balance is interesting as indicating the policy which has worked to strengthening the condition of the property. The directors appropriated $1,500,000 of the 1901 surplus (nearly as large an amount as they appropriated for dividends) as a fund for betterments; they had appropriated the same amount out of 1900 earnings. In addition last year they set aside $250,000 as a fund to restore property destroyed in the spring floods in the Pocahontas coal districts. Thus, close upon half of the surplus over charges in 1901 was turned back into the property. The surplus carried over—$882,030—brought the total accumulated surplus up to $2,633,470. These betterment appropriations follow largely increased maintenance expenses. Thus, in 1901 maintenance expenses accounted for $706,433 (or nearly three-fourths of the total) of the increase in expenses and taxes. The company, in 1901, spent $1,266 per mile for maintenance of way, as against $1,003 per mile in 1900. The increase (about 27 per cent.) is due in part to the large amount

of work done in improving the company's property, especially in replacement of trestles and light bridges by permanent structures. A portion of the cost of this work was charged to operating expenses and the remainder to the Betterment Fund. The list of improvements is a long one. These included 71 miles of main track relaid with 85-lb. rails, 29 miles with 75-lb. rails, and 32 miles of re-sawed 67-lb. rails used in replacing lighter rails. Thirty-five miles of track was fully ballasted and 11,244 lineal feet of wooden trestles and bridges replaced by masonry and embankment, 9,375 ft. replaced by steel or masonry, and 2,500 ft. of bridging thoroughly strengthened. Grades have been improved on five sections of the road; the terminal property at Norfolk has absorbed its proportion of the expenditures.

This work, however, does not exhaust the improvements carried out in the year. Besides that accomplished through larger maintenance cost and special appropriations, capital was charged with $2,361,456 for additions. New construction absorbed $1,382,500, of which new equipment was $801,137.

Construction of new branches added 13 miles to operated road, with further mileage now under construction. More significant, however, is the new construction, undertaken in revising grades, new lines being built at New River and near Flat Top tunnel. The latter work includes two miles of new line, but saves 0.8 mile in distance; it reduces the grade from 2.23 per cent. on the present main line, to 1.1 per cent., and saves over 500 degrees of curvature. At the close of the year about one-half of the grading had been done, including the heading of a tunnel 700 ft. long.

The effect of these expenditures on the property is apparent in the operating results. The small increase in transportation expenses relative to a growth of revenues has been pointed out. In 1901 freight train mileage decreased, despite the larger tonnage movement, and the increase in passenger train mileage was only 7½ per cent. The average load of revenue freight trains has been increased from 435 tons for the preceding year to 461 tons, or 6 per cent., and the work performed shows an increase of 131,834,134 ton miles, or about 4.8 per cent.; while the revenue freight train mileage was reduced 65,361 miles, or 1.04 per cent. The heavy volume of traffic and the fact that coal and coke are 62 per cent. of the total traffic, help the efforts of the management to secure the large train loads reported. But with little change in character of traffic, the train load has been increased by 106 tons since 1898. In regard to the density of traffic, it may be pointed out that on 1,565 miles of road the Norfolk & Western carries more tonnage than the Southern on 6,425 miles. Tons moved one mile by the latter in 1901 were 2,732 millions, while tons moved one mile on the former were 2,864 millions. This is not so very much below the traffic of the Atchison in 1900, the company then moving 3,455 million ton-miles on 7,425 miles of road. The Norfolk & Western secures its heavy tonnage only through very low rates. In 1899 this average had fallen to 3.97 mills. Since then there has been an improvement, and the average ton-mile rate was 4.61 mills in 1901, against 4.30 mills in 1900.

Wabash Railroad.—The report of this company for the fiscal year to June 30 last, shows a great gain in gross, largely due to passenger business and local tonnage together with better rates. Despite excellent progress made in decreasing the cost of tonnage movement nearly all the enhancement in receipts was absorbed in larger working expenses. Practically all the balance of income over fixed charges was appropriated for improvements and additions to property.

In gross receipts the increase was $1,113,500, which was divided almost equally between gains in the freight and passenger business. These increases followed large gains in earlier years. Indeed, President Ramsey makes the statement that "With the close of the fiscal year, we have had forty-seven months of continuous increases in gross earnings, the earnings for the year being $17,554,465, while earnings for the year ending June 30, 1897, were $11,526,787, an increase in four years of $6,027,678, or 52.3 per cent." Little of the additions to gross appear as increased net income. This is due, first of all, to the heavy cost of maintenance with the progress of the company's extensive betterment plans and, in the last year, because of larger fuel cost, higher wages, etc.

Changes in the items of revenue and expenses are brought out in the following income account:

	1901.	1900.	1899.
Earnings:			
Freight	$11,158,966	$10,616,340	$9,212,691
Passenger	4,982,694	4,474,652	3,995,102
Total gross	$17,554,465	$16,440,990	$14,393,974
Expenses:			
Conduct. trans.	$4,765,999	$4,844,253	$4,440,788
Motive power	3,909,315	2,605,625	3,129,737
Maint. of way	2,335,371	1,896,131	1,686,362
Maint. of cars	1,457,151	1,334,758	891,526
General expenses	284,209	266,649	263,059
Total oper. exp.	$12,752,045	$11,947,417	$10,411,473
Net	$4,802,420	$4,493,572	$3,982,500
Taxes	586,199	567,327	567,163
Track rentals	757,938	767,746	760,937
Balance	$3,458,283	$3,158,499	$2,654,400
Total net increase	3,720,460	3,428,112	2,839,431
Improvements	656,756	292,207	.....
Net earnings	$3,063,704	$3,135,905	$2,839,431
Fixed charges	2,760,571	2,715,806	2,691,495
Deb. A bond div.	210,000	210,000	.....
Surplus	$93,135	$210,099	$147,936

Gross and net earnings, exclusive of taxes, and average mileage, compare as follows for previous years:

	Miles.	Gross.	Net.
1898	2,061	$13,207,862	$3,903,083
1897	1,936	11,526,787	3,547,628
1896	1,936	12,807,143	3,564,538
1895	1,935	11,959,839	3,038,809
1894	1,935	12,551,449	2,721,068
1893	1,890	14,220,444	3,412,840

Improvements and additions in the past year were far ahead of those of any previous year, although similar work has been going on for years. Maintenance of way costs averaged about $1,000 a mile. The expenses include large sums expended for other additions to property, equipment, new sidings, station buildings, grade improvements, etc., and far more than the ordinary expenditures for maintenance, all of which was charged direct to operating expenses. The total amount expended for actual additions to real estate, tracks, shops, stations, etc., was $830,066; for new engines, freight and passenger cars, $620,270; for air brakes, steam heat, lighting of coaches, etc., $37,091; total of $1,487,428. Increase in maintenance of way expense was largely due to pushing the work on tracks, to have the track in the best condition for the heavy travel to the Pan-American Exposition. The pushing of this work ahead of the usual time added some $250,000 to the normal expenses. Besides the betterments carried out and charged to expenses, the directors appropriated $554,000 of the year's net income for improvements and additions.

In carrying out the plans for extension new capital was required, and last year new securities were issued to the extent of $6,000,000, of which half represented an equipment mortgage and the other $3,000,000 bonds sold to complete the new Toledo & Chicago Division by building 57 miles of road from Toledo to Montpelier, and another section of road 27 miles long, from near Fort Wayne to near Montpelier at Butler, Indiana, where it connects with the line to Detroit. The latter connection is to supply the connection between the Detroit line and that to the southwest, heretofore supplied by the leased Eel River railroad. This line the Wabash has had to surrender during the last year, through a decision of the Indiana courts. The new Toledo and Montpelier line, Chairman Ashley says, "Will open up a short and direct line between Toledo and Chicago, with advantages which are obvious," and he adds that the extension of the Wheeling and Lake Erie to Pittsburgh, now under way, will give special importance to this new link. The Pittsburgh extension of the Wabash, which is not further referred to in the report, is being built, it may be pointed out by a syndicate controlled by the Gould interests, who also have bought the majority of the stock of the Wheeling & Lake Erie, with its line from Toledo to the Ohio River, and so far the Wabash has not been called on to assume these purchases, or provide for the capital for the new line into Pittsburgh.

Outside of these capital changes, the report of the Wabash is distinguished not only for the amount of betterments being carried out, but for the success in reducing the cost of moving tonnage per unit. Last year there was an increase of 76 millions in tons carried one mile, or 4 per cent., with an increase in loaded car mileage of less than 1⅓ millions, or 1 per cent. Empty car mileage decreased 2⅓ millions, while there was a substantial reduction of foreign car mileage. The final result was a decrease of 1⅓ per cent. in freight train mileage, and an addition of 14½ tons, or 5½ per cent. to the revenue freight train load; and earnings per freight train mile increased handsomely, and were $1.60. The total train load for the year, including company freight, rose 18 tons to 309 tons, while since 1895 the average revenue train load has risen steadily each year from 176 tons, a growth in the period of 117 tons or almost 70 per cent. In this period the increase in tonnage has been 760 million ton miles, or 70 per cent., but the increase in train mileage run has been only from 6,313,800 to 6,981,300.

Canadian Pacific.—The report issued by this company covers 18 months, from January 1, 1900, to June 30, 1901, the fiscal year having been changed. An income account for the 12 months shows passenger receipts of $8,083,370, freight receipts of $18,983,186, and total operating revenue of $30,855,204. Working charges were $18,745,828, and net receipts $12,109,375. The surplus over fixed charges was $5,736,965, which provided for 4 per cent. dividends on the preference stock, of which $31,171,000 was outstanding at the close of the year, and for 5 per cent. dividends on the ordinary shares, $65,000,000 being now outstanding. Besides these two stock issues there is $60,369,100 of 4 per cent. debenture stock in the hands of the public. The amount of the ordinary stock has remained unchanged, but in each of the other two issues considerable amounts have been sold to provide for new construction and improvements.

Maintenance expenditures are increasing as on roads south of the International line, and these higher charges played their part in the enlargement of expenses in 1901, as compared with those shown in 1899 and 1898.

No comparisons are available for 1900, but something can be learned of the development of the system by comparison of the 1901 returns, with those of other years, even though the months covered in the years are not the same:

	1901.	1899.	1898.
Average miles	7,563	7,000	6,681
Earnings:			
Passengers	$8,083,369	$7,098,096	$6,538,589
Freight	18,983,185	18,738,884	16,231,444
Miscellaneous	1,973,452	1,669,063	1,687,991
Gross earnings	$30,855,203	$29,230,038	$26,138,977
Expenses:			
Conduct. trans.	4,476,123	4,256,097	4,014,178
Maint. of way	4,196,188	3,488,253	3,274,642
Motive power	5,745,730	5,286,871	4,866,253
Maint. of cars	1,661,225	1,295,282	962,263
General expenses	1,670,904	1,680,932	1,589,777
Total expenses	$18,745,828	$16,999,872	$15,663,605
Net earnings	$12,109,375	$12,230,165	$10,475,371
Other income	933,425	1,150,198	423,366
Total net	$13,042,800	$13,380,363	$10,898,637
Fixed charges	7,305,835	6,816,676	6,774,321
Steamships app.	150,000	155,000	.....
Surplus	$5,586,965	$6,408,687	$4,124,417
Preferred dividends	1,222,509	954,840	472,708
Common dividends	3,250,000	3,250,000	2,600,000
Surplus	$1,114,546	$2,203,847	$1,051,708

Gross and net earnings and average operated mileage in previous years to December 31, compare as follows.

	Miles.	Gross.	Net.
1897	6,568	$24,049,535	$10,303,776
1896	6,476	20,681,597	8,107,582
1895	6,444	18,941,037	7,480,957
1894	6,344	18,752,167	6,423,309
1893	6,327	20,962,317	7,741,416
1892	6,015	21,409,351	8,420,348

Mileage as reported above includes only that included in the company's traffic returns in the annual reports. On June 30, 1901, total length of line was 8,356 miles, exclusive of the Minneapolis, St. Paul & Sault Ste. Marie and the Duluth, South Shore and Atlantic, which brought the total length of road operated and controlled up to 10,331.

Canadian Pacific reports are lacking in many of those details of operations, which are now usually so freely given in most railroad reports published in this country, and there is no official comment on the causes contributing to the changes in earnings. Last year, however, Canadian Pacific suffered from the lessened movement of spring wheat in its territory, as this year it is already profiting by the bountiful wheat harvest in Manitoba and elsewhere along its lines.

Expansion in mileage, and in capital account, in payment therefor, have continued. In the 18 months to June 30 last, the company has realized $4,208,325 from sale of preference shares, and $6,494,473 by sale of debenture stock. Most of this capital was to acquire new lines in the districts, beyond Manitoba, though many lines were added to eastern division. Some of the proceeds were used also for betterments. The following expenditures charged to capital account, reach about $10,702,800 from new stock capital issues:

Construction, new and branch lines	$2,509,129
Additions and improv. main line and branches	2,413,290
Improvements, leased lines	745,891
Rolling stock, shops and machinery	1,218,105
Manitoba & N. W. Ry. securities	3,312,679
Great N. W. Central Ry. bonds	876,567
Total	$11,075,661

Improvements and additions in the above table, mean for the most part, right of way, real estate, sidings, and "permanent bridges and improvement of line," which are not further specified.

The Struggle for the Line from Salt Lake to Los Angeles and San Diego.

(*Continued from page 637.*)

completed main line grade. It is a down hill, maximum 2 deg. grade from the rim of the basin, to Calientes. The ascent on the east side of the rim is easy, elevation 4,977 ft. at Milford, to 5,991 ft. at the rim.

Train service was inaugurated Aug. 1 at 12:05 a.m., the train reaching Calientes at 11:30 next morning.

The Short Line pushed its tracks beyond the San Pedro trocha at Calientes and laid track for a Y at the Junction. The Y is at the point where the line turns off for Pioche, while the main line goes south. At the end of the old grade the San Pedro had built another short bit of grade on the disputed grade. Here a tent was pitched, and three men were sent to watch it and a fence built. When all was ready Engineer Ashton had a car backed down and the car was pushed through the fence, clearing the way for the track layers, who put in the Y without molestation. There was no clash and no trouble, and the Short Line will go on building its road over the route surveyed by it in 1889. Wherever a San Pedro grade was encountered it was utilized and wherever San Pedro forces were located they were pushed aside.

On Aug. 3 the Short Line sent south three survey parties to make the final location of the line clear through to Los Angeles. The company at present has two other big contracts on hand, one for 90 miles of grade in Idaho and one for 400 miles below Calientes. A portion of the track layers were transferred to the Idaho line, while the surveyors were pushing on from Calientes. The line in Idaho from Blackfoot to Houston will probably be finished about Sept. 15, and, if the surveyors can so far rush their work south, the track layers will again be transferred to Nevada. The line for at least 60 miles below Calientes will be ready for grading bids very soon.

By revision of the surveys of past years a line can be secured shorter than that before described. For instance, if a connection was made with the Southern Pacific at Beaumont the distance would be 821 miles. For comparison only, it might be added the distance via other routes would be as follows: Via Manvel, 938 miles; Barstow, 894 miles; via Daggett and Santa Fe road, 929 miles. On the Beaumont route, 820 miles, 338 miles are already completed, leaving 483 miles for the Short Line to build to reach San Diego by its own rails. The distance from Calientes, the present end of

the Short Line in Nevada, to the Santa Fe tracks is but 200 miles. So that temporary connections could be effected by the building of a very short line across an easy country.

The Beaumont line will be easy to build. It will require no bridge of consequence. The maximum grades are northeasterly from the Southern Pacific crossing 106 ft. per mile; from White River to Morongo, 79; balance maximum of 53. Southeasterly from Uvada, 53 ft. to the mile is the maximum.

In Lincoln County, Nev., the road would tap some mineral country, drawing from the locality of Pioche, De La Mar and the Meadow Valley, Muddy Valley and El Dorado ranges, with gold and silver around Pioche, silver and lead further south, and a great gold district along the Colorado river, near the southern point of Nevada.

The line enters Southern California through the Morongo Pass and the San Gorgonio Pass, which are immediately north of San Diego, and from 80 to 100 miles to the east of Los Angeles; but at Banning it strikes the Southern Pacific and this gives it connection by its combined system to the City of Los Angeles. It is, however, seeking a port on the southern coast where deep sea commerce can be handled cheaply for all foreign ports; and for this reason has selected the port of San Diego. The location of this line in Riverside and San Diego counties follows in the main what was known as the Texas Pacific line from San Diego to the San Gorgonio Pass. Leaving the Pass it would follow through the Protrero through its outlet to the vicinity of the city of San Jacinto; and from thence by the way of Hemet, Winchester and Menifee to Temecula. This San Jacinto country represents more than 100,000 acres of land susceptible of high cultivation.

From Temecula the line extends southward through the Fall Brook and San Luis Rey valley regions, which comprise 100,000 more acres of land. The line would then pass southward through Poway Valley, by the way of Stowe Valley into El Cajon Valley, comprising at least 100,000 acres more of cultivatable lands. Another important feature to be noticed in the line is, that it would give all these valleys the shortest railroad line to the port of San Diego, where all their products could reach the markets of the world.

On Aug. 9 the United States Court at Carson City, Nev., Judge Hawley presiding, granted a restraining order or writ of injunction preliminary to the final hearing to the San Pedro road.

This new move created a sensation; it means that the San Pedro claimed all of the Short Line route through Lincoln County, Nev., as shown by the original Short Line survey of 1889. The San Pedro, to make its claim good, has built stretches of grade all along the route and by so doing secured a restraining order against the Short Line. This injunction is the most important move in the contest for the right of way, as the Short Line is practically obstructed in its work of building to the South, and the decision will be awaited with the deepest interest. If the injunction is not made permanent on Sept. 19, the Short Line, then having its surveys ready, can let contracts and build. C. W. C.

Salt Lake City, Sept. 1.

Work of the Louisiana Railroad Commission.

A statement has been made up, presumably for the convention of Southern railroad commissioners, describing the duties of the Louisiana commission, and giving an account of the work which it has done since its organization, Dec. 9, 1898. The number of formal questions which the board has had to hear and decide is 196. Nearly all the railroads of the state have been inspected, and improvements have been suggested. There has been a marked improvement in the cleanliness and comfort of the cars on local accommodation trains. The commission has investigated the rates on all the roads of the state. An order was issued at the outset forbidding changes without the consent of the commission. During the past two years and five months the commission has ordered 1,050 changes in rates, nearly all of these being reductions. Questions of discrimination have been considered and the railroads have made prompt adjustments on request of the commission. The statement then goes on to specify a number of the rate changes which the Commission has secured. An order to reduce rates on cotton to Shreveport about 30 per cent. is being contested in the courts. The commission has ruled that cotton in round bales must be carried at the same rate as in compressed square bales. Much attention has been given to steamboat rates, which are now stable.

This statement is signed by Mr. Barrow, Secretary of the Commission. It says that the board has been a great public benefactor. The second annual report will soon be issued.

The Louisiana commission consists of C. L. De Fuentes, W. L. Foster and Overton Cade. Mr. Cade was appointed last April to fill the unexpired term of Mr. Sims, who resigned.

TECHNICAL.

Manufacturing and Business.

Galgano Bros. have been awarded a contract for paving Le Count Place, in New Rochelle, N. Y., with creosinate wooden paving blocks made by the United States Wood Preserving Co., of 29 Broadway, New York.

The contract to build the new block, cooper and spar shops for construction and repair at League Island Navy Yard was awarded, Sept. 4, by the Bureau of Yards and Docks, at Washington, to Henderson & Co., Ltd., of Philadelphia, for $107,206.

The Lunkenheimer Company, of Cincinnati, reports that it is securing good orders for its '99 model standard locomotive injector, and that the growing demand from the railroad trade has caused the company to materially increase its injector department.

We are informed that the Dayton draft-gear is being applied to cars building, in various manufacturing and railroad shops, at the rate of 150 cars a day. This, apparently, indicates that the plain spring gear is a very lively competitor for draft-gear honors in the present heavy requirements.

Serrell, White & Cie, of Paris, are establishing a number of selling houses throughout France for the A. S. Cameron Steam Pump Works, of New York. An order for a number of service pumps was received this week, this being the second order from the Marseilles district. The local branch of Serrell & White is at 18 Broadway, New York.

The H. W. Johns Mfg. Co. has recently been awarded a contract by Wm. Cramp & Sons, for Asbestos Bulkhead Insulation to be used on the U. S. battleship "Maine." This company has also received numerous orders for its asbestos insulating and pipe and boiler coverings and other products for use in important buildings, among which are the State Normal School at Fredonia, N. Y.; Connecticut State Prison, Newark Free Library, Newark, N. J., and others.

Pawling & Harnischfeger, Milwaukee, Wis., inform us that their works are now running a double crew, with increased force. Among recent orders are the following: Allis-Chalmers Co., for its new Milwaukee works, one 75-ton, one 25-ton and three 40-ton electric traveling cranes; Baldwin Locomotive Works, five 10-ton electric traveling cranes; Lackawanna Iron & Steel Co., one 10-ton and two 20-ton cranes; Pennsylvania Railroad, one 40-ton crane; Standard Steel Works, four 5-ton cranes; Lukens Iron & Steel Co., two 10-ton cranes, each with a span of 97 ft. 8 in.; American Locomotive Co., one 10-ton crane; Northern Foundry & Machine Co., one 15-ton crane.

The building of ship canals in Russia and the improvement of rivers presents large opportunities for those interested in modern movable bridges. The interests of the Scherzer Rolling Lift Bridge Co., Chicago, within the Russian Empire, have become so extensive as to require the establishment of permanent offices at St. Petersburg. Mr. Eduardovitch O. Gagen, who, for a number of years, has been connected with Russian consulates and is familiar with American engineering and business methods, has been appointed a special representative of the Scherzer Co. for the Russian Empire. After visiting all of the important seaports and waterways of Russia, Mr. Gagen will return to the United States by way of the Trans-Siberian and Chinese Eastern railroads. He will also visit a number of the principal seaports and cities in Japan with a view to further developing the business of the Scherzer Co. already established there. Mr. Gagen will return to Chicago by the Pacific route and will probably be gone a year.

Iron and Steel.

The King Bridge Co., of Cleveland, has recently taken contracts for a number of bridges for the Nickel Plate, the Northern Pacific and the New York Central railroads. It is said the company has enough work on hand to keep it at double turn for the next year.

The 12-hour record at the Sharon Steel Co.'s blooming mill, Sharon, Pa., was broken Sept. 8, when 371 tons of billets were rolled against 347 tons a few weeks ago, the largest previous output. The mill has averaged over 650 tons daily every day during the present month.

Milliken Bros., recently incorporated under the laws of the State of New Jersey, have secured a grant of land at the intersection of the Rahway River and Staten Island Sound, which will give them 2,000 ft. of bulkhead having 21 ft. of water at low tide. Their present plant is in Brooklyn and it is understood that they will build a plant on the new site.

The Uganda Railway.

Col. Gracey, R. E., made a thorough inspection of the Uganda Railway last December and January. His report has been recently published as a government blue book. He estimates that the rails should reach Lake Victoria about October of this year; and that railroad communication with the lake may be expected before the end of the year. Most of the work of construction should be entirely finished by June, 1902.

Pennsylvania Engines at the Baldwin's.

As all the world knows, it has long been the policy of the Pennsylvania Railroad to build its own locomotives. Within this year, however, the Pennsylvania has placed orders with the Baldwin Locomotive Works for 180 engines. Among these there are 56 consolidation and 78 mogul freight engines for the Pennsylvania Railroad, 40 consolidations for the Pennsylvania Lines West, and six engines for the Long Island Railroad, these latter being a switching engine, two Atlantic type passenger engines and three 10-wheelers.

Locomotive Classification.

At the meeting of the Central Railway Club, Sept. 13, a committee presented a report on the matter of locomotive classification. The committee was instructed to discuss the advisability of adopting a plan such that the figures and symbols used may indicate definitely the type of engine. The conclusion was that the committee could not see its way clear to offer a plan of practical value. Anything that it might offer would occupy time and result in nothing but discussion. The committee fails to see what practical value a uniform system of locomotive classification would have. Each road has its own system, which answers more or less well for the purposes of that road, and beyond that any effort to evolve a classification that would be generally adopted would probably be useless.

Whose Bolsters Were These?

At the Master Blacksmiths' convention Mr. S. Wren (Southern Pacific, Sacramento shops) discussed at length a paper on Iron vs. Steel, presented at the last convention. The general idea running through his remarks was that: "Iron of a tensile strength of 52,000 lbs. per sq. in. and 30 per cent. elongation in 4 in., from my experience, will resist such a combination of strains better than low-carbon steel of similar strength." However, he related the following experience with steel: "Recently some old steel car truck bolsters were brought to the scrap pile, defective from shrinkage cracks. I undertook to break one of them where the defect was most pronounced, and to my surprise it did not break as steel usually does by the nick test. I was at once convinced that this was a superior metal. I had the bolster cut into small pieces, piled it similar to scrap iron, worked it under the steam hammer, and, after being brought to a welding heat, worked it into slabs and billets, similar to working wrought iron. I then rolled the same into 1-in. round bars, and tested the bars by nicking and breaking on the anvil. The broken surface showed a good fibrous structure, and was the toughest metal I ever saw in iron or steel. This steel came the nearest to being weldable in its broadest sense of any that I have ever seen. The greatest trouble I had with it was the sand from the mould in which the bolster was cast adhered to the surface and in the cavities with such tenacity that I could not clean it properly. I had a laboratory test made of the one in round bars. The test showed a tensile strength of 72,225 lbs. per sq. in., elongation in 4 in. 28.3 per cent. I doubt if such a test can be found on record. The following is a report of the test made to Mr. H. J. Small, Supt. M. P., by Mr. Howard Stillman, engineer of tests:

Number.	Tensile strength. Lbs. per sq. in.	Elongation. Per cent. in 4 in.
1	71.807	29.3
2	73.079	27.7
3	71.799	27.7
Average	72.225	28.3

The material works easily under the hammer and in the rolls, and is remarkably ductile for so high a tensile strength.

THE SCRAP HEAP.

Notes.

The conductors on the New York, New Haven & Hartford are having to pay $19.50 for their winter suits, which is $1.50 higher than the price which they have paid for several years past.

The State Railroad Commissioners of Connecticut are now inspecting the electric railroads throughout the state, the board having been charged with this duty by the last Legislature. One of the Commissioners says that by this new law the work to be done by the commission will be nearly doubled.

Mails containing important letters for the British Government have just been carried from Australia to London in very much shorter time than ever before, the saving having been, according to one account, 14 days. The new steamship "Ventura," of the Oceanic Steamship Company, made the trip from Sydney to San Francisco in 21 days, five days less than the former regular time, and the mail was taken to Chicago by the regular fast mail train. From there it was taken by a special train, which started an hour-and-a-half behind the regular fast mail, over the Lake Shore, and overtook the regular train at Toledo. The mail arrived at New York on time Saturday morning, Sept. 7, and started for Liverpool two hours later.

Traffic Notes.

The number of trains moved to and from the Grand Central Station, New York City, on Tuesday, Sept. 3, was 571, containing 2,941 cars. This is said to be the largest single day's movement ever recorded at that station.

The conference of presidents of railroads west of Chicago, which was to be held Sept. 5, has been postponed indefinitely. It is given out that the concentration of rate-making authority which has taken place on important roads lately will very likely make it unnecessary to hold further general conferences.

Mr. W. F. Bailey, of Pittsburgh, has just issued a new and revised edition of his "Compendium" of Passenger Rates and Divisions. The matter in the book has been entirely reset, the plates formerly used having been destroyed by fire. A noticeable feature of the last edition is the almost entire absence of unlimited rates.

The Attorney General of Georgia has sustained the railroad commissioners of that state in ordering the Georgia Railroad to refund $12 collected as demurrage on a freight car. The goods on which the charge was made came from Texas and the railroad denied the authority of the State Railroad Commissioners to consider the question of the rightfulness of the demurrage charge, on the ground that, the shipment being interstate, the question of charges could not be regulated by a state authority.

The regulations for charging demurrage on freight cars, which have been agreed to by the railroads centering in

San Francisco and the other terminals in that vicinity, went into effect Sept. 1. The Car Service Bureau is in charge of Mr. E. E. Mote. The time of cars standing at stations is to be computed from 6 p.m. of the day of arrival. The free time for ordinary freight is 48 hours, and for coke, coal and asphaltum 72 hours. The charge on ordinary cars is $1 a day and on tank cars $2 a day. The association will take charge of cars at all stations on the Southern Pacific in California, Arizona, New Mexico and Nevada, and in part of Utah. The Atchison lines and several small roads also belong to the association.

British and American Locomotives.

Indian Engineering of recent date says in part: "Now that Sir Alfred Hickman has set the ball rolling, evidence as to the unsatisfactory performances of American locomotives continues to pour in. . . . The American engines are good as a standby, as a resort in case engines are not available at home; but the theory that they will ever supersede the British article, in countries where British influence is predominant at any rate, contains a fallacy and may now be looked on as exploded." There has been, so far as we are informed, no perceptible shock from this explosion felt in the vicinity of any of the American locomotive works. In Mr. Rudyard Kipling's "Captains Courageous" the central figure is a man who has great pride in his infallible judgment; yet on one occasion he was obliged to admit that he was "mistook in his judgment." This error of judgment was in connection with the identity of a boy who went overboard. We hope that neither the British nor the American "boy" concerned in the locomotive business of the world may go overboard in the industrial sea, but if one boy must go our best information leads us to believe that our contemporary is probably "mistook in his judgment" as to that boy's identity.

The Ohio River Division of the B. & O.

A circular has been issued from the office of the General Manager of the Baltimore & Ohio concerning the taking over of the Ohio River Railroad, Huntington & Big Sandy, Ripley & Mill Creek Valley, Ravenswood, Spencer & Glenville, and the West Virginia Short Line. The General Manager says that it is the desire of the management that officers and employees shall continue in their present positions until further advised. The lines mentioned here will be operated as a separate division to be known as the Ohio River Division, under a Superintendent, who will report to the General Manager of the Baltimore & Ohio.

Train Robbery Near Texarkana.

Passenger train No. 1 of the St. Louis Southwestern was stopped by robbers near Eylau, four miles south of Texarkana, Ark., on the evening of Sept. 3, and about $35,000 was taken from the express car. One of the robbers appears to have been a locomotive runner, for they drove the engineman and fireman off and then took the engine and ran forward a few miles, after the robbery, taking their booty with them. The trainmen followed on a hand car; when they reached the engine the robbers had fled. The passengers and the mail car were not molested.

Changes on the B. & A.

Dining cars are to be run over the Boston & Albany on two express trains which heretofore have stopped 20 minutes for meals at Springfield. By this change, and by a slight increase of speed, the time of the trains through is shortened about 45 minutes. The maximum speed for freight trains, except while descending steep grades, will hereafter be 20 miles an hour instead of 15. While running down steep grades the limit is 17 miles an hour. The speed of passenger trains on these grades, both up and down, is limited to 45 miles an hour, except on the very crooked line between Washington and Chester, where it is 40 miles an hour. The rule heretofore in force forbidding certain passenger trains to make up time when delayed has been abolished; and between Boston and Worcester, 44 miles, the maximum time now for all passenger trains is 55 minutes. Proportionate limits are prescribed for the other divisions of the road. Mr. J. B. Stewart, heretofore Superintendent of the Pennsylvania Division of the New York Central, is to establish a train despatchers' department at Boston. Hitherto each division superintendent has been his own train despatcher.

The fare over the Milford Branch between South Framingham and Milford, 12 miles, has been reduced to 15 cents, with a view to meeting the competition of the street car line between those towns, which, for four or five years past, has taken away a good deal of the travel which formerly went over the steam road. It is said that Vice-President Van Etten, who is now in charge of the Boston & Albany, believes that for distances over 10 miles the Boston & Albany can regain passenger traffic which has been taken away by street lines and can make some profit out of it.

LOCOMOTIVE BUILDING.

H. B. Perry & Co. are having two engines built by the Baldwin Locomotive Works.

The Colorado Fuel & Iron Co. is having four locomotives built by the Baldwin Locomotive Works.

The American Steel & Wire Co. has ordered 7 switching engines from the Baldwin Locomotive Works.

The Chicago & Northwestern is having six engines built at the Schenectady works of the American Locomotive Co.

The St. Clair, Madison & St. Louis Belt Line is having one engine built at the Brooks works of the American Locomotive Co.

The Plant System is having three engines built by the Baldwin Locomotive Works and three engines at the Richmond works of the American Locomotive Co.

CAR BUILDING.

The Atlantic Coast Line has ordered four passenger cars from the Pullman Co.

The Rutland is having 25 freight cars built by the American Car & Foundry Co.

The Canada Northern is having four coaches built by the Barney & Smith Car Co.

The American Car & Foundry Co. has received miscellaneous orders for 417 cars.

The Oregon Short Line has ordered 300 more steel cars from the Pressed Steel Car Co.

The Norwood & St. Louis is having two freight cars built by the American Car & Foundry Co.

The Queen & Crescent has ordered one baggage and three passenger cars from the American Car & Foundry Co.

The St. Louis & San Francisco has ordered 50 flat cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Erie has placed orders for 2,000 box cars of 60,000 lbs. capacity. Half of these will be built by the Pullman Co. and the balance by the American Car & Foundry Co.

The Hamlin Car & Wheel Mfg. Co. has received two orders for cars for Cuba. One of these is from Carlos, Booth & Co., 17 State street, New York city, calling for 10 coal cars; the other comes direct from a sugar plantation and is for 20 all-steel cars.

The Burlington, Cedar Rapids & Northern has ordered three postal cars, 60 ft. long, from the Pullman Co., for October delivery, as reported in our issue of August 30. The special equipment includes Congdon brake shoes, Westinghouse brakes, National couplers, Fletcher-Morris journal box lids.

The Illinois Central has ordered 500 coal cars and 300 box cars of 80,000 lb. capacity from the American Car & Foundry Co., all for November delivery. The coal cars will measure 36 ft. by 8 ft. 6 in. over sills. Box cars will measure 40 ft. 7⅝ in. by 9 ft. 1⅝ in. over sills. The special equipments include Fox and Kindl trucks, Common Sense bolsters, Westinghouse brakes, Buckeye couplers, Thornburgh drawbar attachment and Hewitt journal bearings.

BRIDGE BUILDING.

ALPENA, MICH.—A bridge at least 23 ft. high is ordered built by the Alpena & Western R. R., where it crosses the Detroit & Mackinac.

ASHCROFT, B. C.—A site has been selected by the provincial government for a new bridge across the Fraser River at Chimney Creek, to cost $20,000.

BATAVIA, N. Y.—Plans and specifications are soon to be made for a bridge 109 ft. long, with 33-ft. roadway and one 7-ft. sidewalk, to be built in Batavia.

BIDDEFORD, ME.—The new bridge across Saco River in Biddeford will be built by the Boston & Maine R. R. this fall.

BINGHAMTON, N. Y.—The contract for the bridge at Exchange street is let to the Owego Bridge Co. at $49,915. Work will be started immediately. The following are the bids submitted: Ellery Colby, superstructure $30,250, entire $59,445.50; American Bridge Co., superstructure $29,200, entire $57,275; Berlin Construction Co., superstructure $30,100, entire $58,805; King Bridge Co., superstructure $32,000, entire $60,012.25; Owego Bridge Co., superstructure $27,000, entire $49,915; Penn Bridge Co., superstructure $30,000, entire $60,566; Syracuse Bridge Co., superstructure $31,200, entire $61,161; Canton Bridge Co., superstructure $32,000, entire $62,125.

CHARLES CITY, IOWA.—The Board of Supervisors of Floyd County have ordered a bridge built across Cedar River at this place. It will have one steel span and will be at the foot of Milwaukee street, and cost about $15,000.

CHICAGO, ILL.—According to report, bids will soon be wanted for a bridge at West Division street, over the North Branch on the west side of "Goose Island." Estimated cost, $150,000.

COLONIE, N. Y.—The Town Board has asked the New York Central to lengthen its bridge over the Schenectady turnpike. According to report, a new bridge is under consideration at a cost of about $40,000.

ERIE, PA.—The Pennsylvania is considering building an iron bridge over the tracks on Buffalo Road east of East avenue. It will be 170 ft. long.

GREENSBURG, PA.—The Grand Jury has recommended a joint county bridge be built over the Youghiogheny River to connect Vista, Westmoreland County, and Buena Vista, Allegheny County.

HOUSTON, TEX.—A committee of citizens and of the County Commissioner's Court is considering building a new bridge over Buffalo Bayou, somewhere between San Jacinto street bridge and the Gulf, Colorado & Santa Fe bridge. I. Austin Miller, City Engineer.

HUNTINGTON, W. VA.—J. C. Miller is reported in the market for a standard gage railroad bridge of 180-ft. span.

MURREY, UTAH.—The Oregon Short Line will build an overhead crossing at Murrey, and at Palas the new crossing will be made under the railroad.

INDIANAPOLIS, IND.—The Board of Commissioners of Marion County will receive bids, Sept. 20, for a concrete arch bridge over ditch on West Thirtieth street, one-half mile west of Little Eagle Creek in Wayne Township. James E. Greer, Commissioner.

MILWAUKEE, WIS.—Bids are wanted, Nov. 1, for a highway bridge over the Milwaukee River from Broadway to Lake street. Charles J. Poetsch, Commissioner of Public Works.

The Chicago, Milwaukee & St. Paul has notified the city that it will put a new bridge across the Menomonee River directly east of West Water street bridge just as soon as the city puts up a new bridge over the river at West Water street.

MUSKOKA DISTRICT, ONT.—The Ontario Public Works Department will build two bridges in this district. One will be at Bala and the other at Magnetewan. Robert McCallum, Confederate Life Building, Toronto, is the Government Engineer in charge.

NEWPORT, KY.—A viaduct over Mill Bottoms at Sixth street is reported under consideration, to connect with Bellevue.

NORTHFIELD, MASS.—Francis Schell is reported to have offered the town a gift of $32,000 for the bridge proposed over Connecticut River. (June 28, p. 472.)

NATCHEZ, MISS.—Stanton & Son, architects, of Natchez, are preparing plans for a bridge across a stream near that city. It is to be of steel, with concrete piers, and will have a draw of 176 feet and one span of 100 feet. The Board of Supervisors will let the contract at its next meeting.

OGDEN, UTAH.—Proposals will be received by C. R. Hollingsworth, County Clerk, until the 23d, for a steel highway bridge across the Ogden River at or near the mouth of Ogden Canyon.

PADUCAH, KY.—According to report, plans are being made for a half million dollar bridge for the Illinois Central over the Tennessee River about 17 miles from Paducah, on the Louisville Division.

PITTSBURGH, PA.—An ordinance is before the Council authorizing contracts for bridges in Lincoln avenue across Beechwood boulevard, in Oakland from near Wilmot street to Schenley Park and at South Tenth street, at a total cost not to exceed $546,500. These bridges have long been in contemplation.

The Secretary of War has approved the plans for rebuilding the Panhandle bridge over the Monongahela River at Try street. The new bridge, it is said, will have two spans.

PROVIDENCE, R. I.—The matter of rebuilding the bridge which spans the Ten Mile River on Roger Williams avenue came before the Town Council the past week. The town has appropriated $4,000 for the work.

ROCKFORD, OHIO.—The Big Four will build an overhead bridge at the intersection of Linndale road, the Settlement road and the railroad tracks.

RUTLAND, VT.—New bids are wanted, Sept. 16, for a steel truss bridge to replace the Ripley bridge in Rutland. Arthur C. Grover, City Engineer.

SWAMPSCOTT, MASS.—A bridge is proposed over the Boston & Maine tracks at Essex street.

WATERLOO, IOWA.—Plans have been made by J. B. Marsh, of Des Moines, for a bridge over Cedar River. It is to have seven spans on concrete piers and cost about $75,000.

WESTMINSTER, MD.—Bids are wanted, until Sept. 30, by J. E. Mannheimer, for a steel bridge over Big Pipe Creek, according to plans on file at the office of the County Commissioners.

WOODSDALE, OHIO.—The contract for the steel bridge over Miami River (Aug. 2, p. 553) is let to Joseph F. Guillaume. The bids on the bridge were as follows: Brackett Bridge Co., $31,000 and $22,000; Newcastle Bridge Co., $43,235 and $15,800; Cincinnati Bridge Co., $36,300 and $25,500; Massillon Bridge Co., $32,000, $28,000 and $22,500; Bellefontaine Bridge Co., $28,000; King Bridge Co., $14,000, $21,000, $36,970 and $28,400; Champion Bridge Co., $26,000 and $35,000; American Bridge Co., $23,489, $20,939, $15,480 and $12,877; W. N. Andrews, $36,420 and $34,320; Joseph F. Guillaume, $36,020, $21,750 and $20,850.

Other Structures.

ALBIA, IOWA.—The Chicago, Burlington & Quincy will build a depot at Albia, the estimated cost of which is $20,000. The plans have been made.

BUFFALO, N. Y.—The Buffalo Forge Company has been incorporated in New York, with a capital of $1,000,000, half preferred stock, to make forges, ventilators, engines and machinery in Buffalo. The directors are William F. Wendt, Henry W. Wendt, and Elizabeth Wendt, of Buffalo.

CINCINNATI, OHIO.—The Black-Pollak Iron Co., according to report, will build a machine shop near Carthage. The structure will be of brick and steel, 95 x 140 ft.

CLARKSBURG, W. VA.—The Jackson Iron & Steel Co. was recently incorporated in West Virginia with $300,000 capital stock, and will build a tin plate mill here. Moore Jackson is President.

CORTLAND, N. Y.—An addition, 300 x 90 ft., will be built to the wire plant of Wickwire Bros.

FORT WORTH, TEXAS.—The St. Louis South-Western, according to report, is considering removing its local terminal to a more central location.

GARDNER, MASS.—According to report, the Boston & Maine is considering building a new station to take the place of the Heywood station at West Gardner.

GREENVILLE, TENN.—The Sherman, Shreveport & Southern will build a roundhouse and machine shop 47 x 65 ft.; car repair shop, 18 x 45 ft., and store room and oil and sand houses.

MONTREAL, QUE.—J. A. Jamieson, of Montreal, has been awarded, by the Montreal Harbor Commissioners, a contract to build in the Harbor, a million-bushel steel elevator. The bids by the various firms were as follows: J. A. Jamieson, $642,000; Barnett & Record, Minneapolis, $820,000; McDonald Engineering Co., Chicago, $975,000; A. F. Chapman, Buffalo, $1,090,000.

NEW ALBANY, IND.—The Ohio Falls Iron Works will soon add to its plant five sheet mills.

NEW CASTLE, PA.—The New Castle Iron & Steel Co. has applied for incorporation, with a capital stock of $1,500,000, and will build a plant at New Castle to make steel bars, light rails and shapes. A site has been selected and contracts have been let to the United Engineering & Manufacturing Co., of Pittsburgh, for a 12-in. mill, and an 18-in. mill. A. F. Baumgarten, General Manager, 518 Park Bldg., Pittsburgh.

NICETOWN, PA.—According to report, plans will soon be sent out by the Midvale Steel Co. for bids on a large addition to the present plant. This work will include machine shop four stories high, built of brick and iron, 50 x 100 ft.

PATERSON, N. J.—At a recent meeting of the Directors of the Passaic Rolling Mill Co. it was decided to spend $500,000 in increasing the plant. A new reheating furnace, with a new charging machine, will be built and two 30-ton smelting furnaces will be added. An electric power house will be built, and other large improvements made.

SAN ANTONIO, TEXAS.—According to report, all bids have been rejected for the new Southern Pacific passenger depot in San Antonio. The bids ranged from $91,000 to $139,750.

SCRANTON, PA.—President Truesdale, of the Lackawanna, is reported as saying that improvements are contemplated by the company in Scranton, which include enlargement of the roundhouse, and rebuilding of the car and machine shops. The company is also said to be considering a new station for Scranton, for which plans are said to be under way.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvii.)

Railroad Postal Clerks' Meeting.

The National Association of Railway Postal Clerks, and the United States Railway Mail Service Mutual Benefit Association, will hold their annual conventions at Milwaukee, Wis., beginning Tuesday, Sept. 17.

New York Railroad Club.

At the first fall meeting of the New York Railroad Club, to be held Sept. 19, at 8 o'clock, p.m., Mr. F. M. Nellis, Secretary of the Air-Brake Association, will read a paper on "Brakes in Railroad and Street Car Service." Invitations have been extended to a number of air-brake experts and a large attendance is looked for.

Western Railway Club.

The next meeting of the Western Railway Club will be Tuesday afternoon, Sept. 17, at the Auditorium Hotel,

Chicago. Mr. S. P. Bush, General Manager of the Buckeye Malleable Iron & Coupler Co., will open a topical discussion of "Some of the Duties of Mechanical Officers." Also, a paper will be presented by Mr. W. S. Worman, Fire Inspector of the Chicago & Northwestern, on "Fire Risks of Railroads."

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. E. J. Duchesnay, Assistant General Superintendent of the Pacific Division of the Canadian Pacific, was accidentally killed near Vancouver, B. C., on September 4, by a rock falling on him.

—Mr. David M. Watt, formerly Superintendent of the West Pennsylvania Railroad Division of the Pennsylvania is dead. He was born Feb. 22, 1843, at Philadelphia, Pa., and entered railroad service in 1864. Mr. Watt's entire railroad career had been with the Pennsylvania.

—Mr. John Gill, the new Superintendent of Motive Power of the Chicago, Indianapolis & Louisville, entered railroad service in 1869 on the Missouri Valley, which was absorbed, in 1871, by the Kansas City, St. Joseph & Council Bluffs, continuing with the last-named company until 1887. In March, 1887, he became an engineman on the Chicago, Rock Island & Pacific, becoming General Foreman the following year and later Division Master Mechanic. Mr. Gill was born March 14, 1856, at Joliet, Ill.

—Mr. J. F. Cassell, whose appointment as Chief Engineer of the Elgin, Joliet & Eastern was recently noted (page 611), was formerly Division Engineer of the Baltimore & Ohio. He was educated as a Civil Engineer in Germany and entered the service of the Baltimore & Ohio in 1881 at the age of 21 and remained with this company up to the time of his new appointment. During this time he was Resident Engineer of Construction on the Valley Railroad of Virginia, Draughtsman, Assistant Engineer Maintenance of Way and Division Engineer.

—Mr. Grant Hall, Division Master Mechanic of the Canadian Pacific, is 37 years old. In 1883 he was connected with the Grand Trunk as an apprentice and from 1886 to 1888 was machinist on the Canadian Pacific and from then until 1893 was locomotive foreman. In 1893 he was appointed General Foreman of the Intercolonial Railway of Canada, returning in 1898 to the Canadian Pacific. The following year (1899) he became General Foreman and received his recent appointment, that of Master Mechanic of the Pacific Division, in July of the present year.

—Mr. A. W. Thompson, Division Engineer of the Baltimore & Ohio, was born in Erie, Pa., in 1875. For seven months, in 1896, he was rodman on construction on the Pittsburgh, Shenango & Lake Erie. The next year (1897) he graduated from the Allegheny College and was Draughtsman for Wilkins & Davidson, Civil Engineers, from June, 1897, to February, 1898. He then went with the Pittsburgh & Lake Erie, remaining there until August, 1899, when he went with the Baltimore & Ohio, becoming Assistant Engineer in 1900. Mr. Thompson took his present position, that of Division Engineer, on Sept. 1, this year.

—Mr. William A. McGonagle, who, on July 5 last, became Assistant Chief Engineer of the Duluth & Iron Range, is a native of Pennsylvania, having been born in Conshohocken March 28, 1861. He was graduated from the University of Pennsylvania and entered railroad service in 1881 as a transitman on location on the Little Falls & Dakota Branch of the Northern Pacific. From 1881 to 1883 he was Assistant Engineer and in the last named year (1883) became Assistant Engineer, Resident Engineer and Superintendent of Bridges and Buildings of the Duluth & Iron Range. Mr. McGonagle was elected President of the Association of Railway Superintendents of Bridges and Buildings in 1895.

—As noted Sept. 6, Mr. John Erhardt Muhlfeld has resigned as Master Mechanic of the Montreal shops, Grand Trunk Ry., to become Superintendent of Machinery and Rolling Stock of the Intercolonial Railway, with headquarters at Moncton, N. B. This is an instance of a young man with a technical training reaching an important place after a varied experience of about ten years in the shops and in subordinate mechanical positions. Mr. Muhlfeld is not quite 29 years of age, and has plenty of hard sense and abundant energy. He was born at Peru, Ind., Sept. 18, 1872. Entering the mechanical engineering course of Purdue University in 1889, he put in one summer vacation as assistant to the engineer in charge of construction work on the Peru & Detroit Ry., and two vacations as machinist apprentice in the Fort Wayne shops of the Wabash. In 1892 he returned to the Fort Wayne shops and served as machinist and chargeman until July 1894, when he was a locomotive fireman until the following November. Mr. Muhlfeld was then appointed roundhouse foreman of the Wabash at Peru, Ind., and one year later was made general foreman of the Danville shops. In March, 1898, when the new Wabash Line was opened between Detroit and Buffalo, through Canada, he was made general foreman in charge of the locomotive and car departments of the Buffalo Division, with headquarters at St. Thomas, Ont. In February, 1899, he left the Wabash to become master mechanic of the Western Division of the Grand Trunk, with headquarters at Port Huron, Mich., and two years later he was transferred to the Montreal shops, holding that master mechanicship until his recent appointment to the Intercolonial. This is an excellent example of how a young man with the proper qualifications and training may be advanced in a very few years.

—Mr. Cecil Gabbett, who, on Sept. 15, severs his connections with the Seaboard Air Line as Fourth Division Superintendent, will, after that date, be engaged in the lumber business in Savannah. Mr. Gabbett has been Superintendent of this division since the consolidation of the Georgia & Alabama Railroad with the Seaboard. Prior to that he was First Vice-President and General Manager of the Georgia & Alabama. He entered railroad service about 1870. Was President and General Manager of the Atlanta & West Point, which position he held for 12 years. He then became General Manager of the Central of Georgia, later becoming Vice-President and General Manager of the Georgia & Alabama.

—Mr. P. T. Downs, Assistant General Superintendent of the Great Northern Railway, was instantly killed in a train wreck at Nyack, Mont., on Aug. 30. Mr. Downs who, according to report, was about to become Vice-President of the Spokane Falls & Northern, was born in Ireland 54 years ago. He entered railroad service in 1868 as a passenger brakeman on the Central Vermont. In 1886 he became Division Superintendent of the Louisville & Nashville, in 1891 trainmaster of the Gulf, Colorado & Santa Fe and in May of the same year was appointed Division Superintendent of the Atlanta & West Point. This position he held for two years, at the end of which time he became Superintendent of Transportation, later becoming Acting General Superintendent. Mr. Downs had held the position of Assistant General Superintendent of the Great Northern since Dec. 1, 1899.

—Baron Mori Jusuke, one of the leading railroad men of Japan, was killed in a railroad accident, July 13, together with his youngest son, 11 years of age. The locomotive was disabled on a steep grade and the brakes being inefficient the train began to run backward down the grade. Baron Mori jumped off, and in endeavoring to get his son off, both, in some way, fell under the wheels and were killed. Baron Mori entered the class of 1875 at the Rensselaer Polytechnic Institute under the name of Yamamoto. He left during the second year on account of ill health. A few years later he was Chief Engineer of the Nippon Railroad, having already served with distinction in the army and seen something of actual war. He became President of this railroad, which position he held for a few years and then resigned, remaining, however, connected with the road as Consulting Engineer. About two years ago he was raised to the peerage with the rank of Baron. He was an active and able man, probably about 55 years old at the time of his death. Mr. Matsmoto, Director of the Imperial Railways of Japan, sent the particulars of his death to Mr. J. A. L. Waddell, who was a classmate and friend of Mori's, and to Mr. Waddell we are indebted for this information.

ELECTIONS AND APPOINTMENTS.

Ann Arbor.—W. C. Jones has been appointed Assistant Superintendent.

Arkansas Southern.—T. B. Coppage has been appointed Superintendent, with headquarters at Ruston, La., succeeding J. M. Walsh, resigned.

Atchison, Topeka & Santa Fe.—M. J. Collins has been appointed Assistant General Purchasing Agent, with headquarters at Chicago, Ill.

F. B. Houghton has been appointed Assistant General Freight Agent, with headquarters at San Francisco, Cal.

Benwood & Wheeling Connecting.—Peter Boyd has been appointed General Superintendent, with headquarters at Pittsburgh, Pa.

Canadian Pacific.—Lacey R. Johnson has been appointed Assistant Superintendent of Rolling Stock.

Central of New Jersey.—C. L. Hollis has been appointed Acting Superintendent of Ferries, with headquarters at New York.

Charleston, Clendennin & Sutton.—T. H. Given has been elected President, with headquarters at Pittsburgh, Pa., and S. L. Harman becomes Secretary and Treasurer, with headquarters at Philadelphia, Pa.

Chicago, Burlington & Quincy.—R. L. Porter has been appointed Auditor of Expenditures, succeeding F. S. Bagg, transferred. G. S. Cooper succeeds Mr. Porter as Auditor of Ticket Accounts.

Erie.—A. M. Mozier has been relieved of the duties of General Superintendent of the Ohio Division and has been assigned to special duties.

Ft. Smith & Western.—J. J. Mahoney, heretofore General Superintendent, General Freight and Passenger Agent and Purchasing Agent of the Winona & Western, has been appointed General Manager of the Ft. S. & W.

Georgia.—J. H. Watters, heretofore Division Master Mechanic of the Louisville & Nashville, has been appointed Master Mechanic of the Georgia, with headquarters at Augusta, Ga.

Great Northern.—H. A. Kennedy has been appointed Assistant General Superintendent of the Western District, with headquarters at Spokane, Wash., succeeding P. T. Downs, deceased. L. W. Bowen becomes Acting Superintendent of the Kalispell Division at Kalispell, Mont., succeeding Mr. Kennedy.

Gulf & Brazos Valley.—G. C. Rivers, heretofore Secretary and Auditor, has been appointed General Superintendent, succeeding W. C. Forbess, General Freight and Passenger Agent and General Superintendent, resigned.

Houston & Texas Central.—J. N. Miller has been appointed Acting Manager.

Louisville & Nashville.—J. H. Watters, Division Master Mechanic, with headquarters at Anniston, Ala., has resigned. (See Georgia R. R.)

Louisville, Henderson & St. Louis.—Ridgely Cayce, heretofore Assistant to the President and Assistant Secretary, has been elected Secretary, succeeding E. M. Post, resigned.

Marshalltown & Dakota.—T. W. Carpenter has been appointed General Manager, with headquarters at Fraser, Iowa, succeeding M. F. Collins, resigned.

Mexican Northern.—A. F. Higgins, Treasurer, has been elected President, also, succeeding R. S. Towne, resigned. W. J. Palmer has been elected Second Vice-President.

Missouri Pacific.—W. C. Dallas has been appointed Assistant Superintendent of the Locomotive and Car Department.

Mobile & Ohio.—J. M. Beall has been appointed Assistant General Passenger Agent, with headquarters at St. Louis, Mo.

George Manuell, Division Master Mechanic, has resigned. A. B. Minton, Division Master Mechanic at Murphysboro, Ill., will assume the duties formerly discharged by Mr. Manuell, with headquarters at Jackson, Tenn.

Moshassuck Valley.—A. H. Aldrich has been appointed General Superintendent, succeeding G. M. Clarke, resigned.

New York Central & Hudson River.—Geo. W. Vaughan has been appointed Division Engineer of the Western Division, succeeding S. W. Hayes, resigned. Charles E. Lindsay becomes Division Engineer of the Pennsylvania Division, succeeding Mr. Vaughan, effective Sept. 5. George A. Pray has been appointed General Agent, with headquarters at New York, succeeding G. H. Stevens.

Oregon Railroad & Navigation.—Wilbur E. Coman, heretofore General Agent of the Oregon Short Line, has been appointed Assistant General Freight Agent of the O., R. & N., with headquarters at Portland, Ore., succeeding R. B. Miller, resigned. (See Southern Pacific.)

Peoria & Pekin Union.—C. S. Millard has been appointed Engineer Maintenance of Way.

San Pete Valley.—S. T. Pearson, Secretary, Treasurer and Auditor, with headquarters at Salt Lake City, Utah, has resigned. U. U. Hiskey succeeds Mr. Pearson.

Seaboard Air Line.—T. W. Whisnant, First Division Superintendent, with headquarters at Raleigh, N. C., has resigned.

Southern Pacific.—R. B. Miller, heretofore Assistant General Freight Agent of the Oregon R. R. & Navigation, has been appointed General Freight and Passenger Agent of the Pacific System of the S. P., with headquarters at Portland, Ore.

C. H. Markham, heretofore General Freight and Passenger Agent of this system, has been appointed Assistant Freight Traffic Manager, with headquarters at San Francisco, Cal.

J. McGuire has been appointed Superintendent of Terminals.

Tennessee Coal, Iron & R. R.—H. A. Turner has been appointed Chief Engineer.

Toledo, St. Louis & Western.—The position of Chief Engineer has been abolished.

Union Pacific.—George G. Herring has been appointed General Agent of the Freight and Passenger Departments, with headquarters at Detroit, Mich., succeeding D. W. Johnston, resigned. W. H. Connor becomes General Agent at Cincinnati, Ohio, succeeding Charles Clifford, transferred.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA SOUTHEASTERN.—Incorporation papers have been filed for this company at Montgomery. The capital is $300,000, and the incorporators are: M. W. Filkey, E. L. Russell, R. V. Taylor, Henry Fonde and A. D. Andrews.

ATCHISON, TOPEKA & SANTA FE.—This company, on Aug. 27, secured a charter in Oklahoma for 14 separate lines of railroad, with a total length of 815 miles, as follows:

No. 1. From Guthrie east to the west line of the Creek Nation.

No. 2. From Bills, on the Ponca Reservation via Pawnee to the north line of the Creek Nation, near the confluence of the Cimarron and Arkansas rivers.

No. 3. From a point on line No. 1 in Payne County northeast via Stillwater, Pawnee and Pawhuska to a connection with the Santa Fe at Bartlesville, Ind. T.

No. 4.—From a point on line No. 3 in Pawnee County, near Ralston, north to the Kansas State line; length, 40 miles.

No. 5. From Ponca City northeast to Elgin, Kan.

No. 6. Beginning at a point on line No. 4, north of Ralston, northwest to a junction with the Santa Fe near White Eagle.

No. 7. Beginning at a point on line No. 5, near the Arkansas River in the Kaw Reservation, northwest to the Kansas State line.

No. 8. From Perry north to line No. 3 at Pawnee.

No. 9. From the terminus of line No. 1 east into the Cherokee Nation to the Santa Fe near Owasso.

No. 10. From Pawnee south to the Canadian River, northeast of Paul's Valley; thence southwest to the Choctaw Railroad near Dougherty.

No. 11. From Cushing southeast to line No. 10 near Shawnee.

No. 12. From line No. 10 near the crossing of the Canadian River southwest to Paul's Valley

No. 13. From line No. 10 in the valley of Little River to the Santa Fe, between Noble and Walker.

No. 14. From Guthrie north to the branch line of the Santa Fe near Alva.

The chief offices are at Guthrie, and the capital stock is $2,200,000.

BESSEMER & LAKE ERIE.—It is reported that the cut-off between Kremis and Osgood, Mercer County, Pa., will be ready for use this winter. The cut-off is about nine miles long; two miles shorter than the old line, and a bad curve is saved. Double-tracking of nearly the entire system is said to be under consideration, together with the rebuilding of all old bridges, and general renovation of the line.

BRITISH COLUMBIA ROADS.—The right of way from Vancouver, B. C., to New Westminster, 15 miles southeast, is said to have been secured for the Hill-Morgan interests by J. Clergue, of Sault Ste. Marie. By purchase of the Hastings mill property, the only water front in Vancouver not owned by the Canadian Pacific has been secured.

BUFFALO & SUSQUEHANNA.—It is said that a branch five miles long will be built from the present terminus at Ansonia, Pa., up the Marsh Creek Valley to Asaph Run in timber country.

CALIFORNIA EASTERN.—An extension is reported from Manvel to the desert, east of San Bernardino, which, it is thought, will eventually form part of the San Pedro, Los Angeles & Salt Lake. The California Eastern runs from Blake, Cal., on the Santa Fe Pacific, 29 miles north to Manvel, and is projected to Goode Springs, Nev., 80 miles in all. It is a successor to the Nevada Southern (1896).

CALIFORNIA ROADS.—Surveys are reported for a railroad between Corona, Cal., and a cement mine near the top of the Temescal range of mountains. J. H. Dockweiler, formerly City Engineer of Los Angeles, is in charge. The franchise was obtained by Eben B. Crane, of Corona.

CANADIAN PACIFIC.—It is said that the extension from Sharbot Lake, Ont., on the line of the Kingston & Pembroke, to Carleton Place, 40 miles northeast, will be built at once. The last session of the Legislature granted the Kingston & Pembroke a subsidy to build this line, and now that the latter company has passed into control of the Canadian Pacific, the proposed extension will give the C. P. a direct connection, as well, between Ottawa and Toronto.

CHICAGO & NORTH WESTERN.—It is said that 44 miles of the new Princeton-Marshfield line in Wisconsin has been opened. The entire length of the line is to be 105 miles, including two branches.

CHICAGO, ROCK ISLAND & PACIFIC.—It is said that the extension from Liberal, Kan., to El Paso, will be

finished in about two months. The grading is reported completed, and about 150 miles of track remain to be laid to a connection with the El Paso & Northwestern. (Construction Supplement, March 8.)

COLUMBUS & CINCINNATI TRACTION.—This company has been incorporated in Ohio, with a nominal capital, to build 72 miles of electric line between Columbus and Cincinnati, by way of Milford, New Boston, Marathon, Monterey, Fayetteville, Hillsboro and Greenfield. The estimated cost is $2,000,000. Henry Burkhold, of Cincinnati, is President.

DENISON, BONHAM & NEW ORLEANS.—Shipments of steel are reported to Denison for the new line to be built 30 miles southeast to Bonham, and it is said that work will begin at once. The Missouri, Kansas & Texas is parallel for part of the distance between Denison and Bonham, and the Texas Pacific for the remainder. (May 10, p. 323.)

DES MOINES SOUTHERN.—The preliminary surveys for this line from Des Moines, via Winterset to Greenfield, Iowa, have been completed and right of way is being secured. The City Council of Winterset has ordered a special election to vote on the proposition to levy a tax of 5 per cent. to aid the road. (July 3, p. 491.)

DETROIT & CHARLEVOIX.—Trains are reported running from Alba to Frederic, Mich., 24 miles. The line is nearly finished to South Arm, Mich., 18 miles northwest, and it is thought that it will be in operation within a few days. (April 19, p. 275.)

GREAT NORTHERN.—It is said that a connection will be built between the Great Northern and the Northern Pacific, from Jocko, Mont., to Butte, 60 miles, in order to give an outlet for the coal produced in the Crows Nest country.

HANCOCK & CALUMET.—There are reports that this road is to be converted to standard gage during October.

HAWAIIAN ROADS.—Application has been made to the Honolulu treasurer for a charter for the Kona & Kau railroad company, for a term of 50 years, with a capital of $50,000, which may be increased to $10,000,000. Permission is desired to build in North Kona, South Kona, and Kau, Hawaii, and also to deal in lands and build hotels along their line. Practically the whole southern portion of the island of Hawaii is covered by the request.

Kahului R. R.—Surveys are reported for an extension of this line in the island of Maui, from Kahului, on the southwest coast, to Hamakuapoko and Paia, in order to reach sugar plantations.

ILLINOIS CENTRAL.—It is said that 408 miles of double track will be in operation within a year, between Chicago and Fulton, Ky.

INDIANA CENTRAL (ELECTRIC).—This company has been incorporated to build an electric road from Indianapolis, 75 miles north to Peru, Ind., through Marion, Hamilton, Tipton, Howard and Miami counties. The line will parallel the Lake Erie & Western a great part of the way. The directors are: Charles H. Holmes, Allen Shewon, Thomas M. Boyd and Frank H. Ray, of Kokomo, and James Lynn, of Wabash.

LIBERTY TURNPIKE ELECTRIC.—Articles of incorporation have been filed in Maryland for an electric road to run from Baltimore to North Branch, Md., 17 miles west. Frank H. Callaway and James F. Ingram, Jr., are directors, and the capital stock is $150,000.

LONE MOUNTAIN & MINERAL.—Surveys are reported for a new road from Lone Mountain, Tenn., through Hancock and Claiborne counties to St. Paul, Va. It is said that the length will be about 100 miles.

MAINE ROADS (ELECTRIC).—Surveys are reported for an electric line 12 miles long between Augusta and Winthrop, Me. The estimated cost is between $250,000 and $300,000, and the granite quarries at Hallowell are to be reached. It is planned to carry the stone by the new road. Gov. J. F. Hill is one of the promoters.

MASON & OCEANA.—Maps have been approved showing the location of the proposed line from Hesperia, Oceana County, Mich., to Newaygo, 18 miles southeast. The Pere Marquette has filed maps covering practically the same line between Fremont and Newaygo, crossing the Mason & Oceana line twice. (June 14, p. 422.)

MICHIGAN ROADS.—The Chicago & Grand Trunk and Pere Marquette companies have purchased rights of way, and will in a short time begin building a joint belt-line track around the city of Lansing, Mich., reaching several factories.

MILWAUKEE, BURLINGTON & LAKE GENEVA.—This company has been granted a franchise for an elevated railroad in Milwaukee, unlimited as to time, and without compensation. The franchise begins in the heart of the city, and extends to the city limits, giving access to the Post Office, elevators, and the best dockage in the city, near the harbor entrance.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The extension from Wishek, N. Dak., to the Missouri River in South Dakota is completed and open for traffic as far as Ashley, N. Dak., 20 miles. It is to be continued this winter as far as Herbs, N. Dak. (June 14, p. 422.)

MINNESOTA LAND & CONSTRUCTION.—Articles of incorporation have been filed in Minnesota for this company, with a capital stock of $100,000, half of which must be paid in before business is begun. It is empowered to build railroads, depots, wharves, docks, shops, telegraph and telephone systems, etc., and to hold property and stock and bonds of other companies. The headquarters are in Duluth. The officers are: President, J. L. Washburn, Duluth; Vice-President, Henry L. Levy, Eau Claire, Wis.; Secretary, James F. Walsh, Duluth; Treasurer, W. K. Coffin, Eau Claire.

MT. ROGERS & EASTERN.—The freeholders of Floyd County, Va., have voted to subscribe $150,000 to this company, which is to connect with the Franklin & Pittsylvania Division of the Southern at Lynchburg and cross the Blue Ridge Mountain, either at Adney's Gap, Daniels' Run Gap, or Callaway's Gap.

NEW YORK CENTRAL & HUDSON RIVER.—Contracts have been let to the extent of $3,000,000 for improvements on the property along the west side of the North River, including new piers, marine repair shops, a ferry house and slip at Weehawken, N. J., etc.,

NORTHPORT TRACTION.—This company was incorporated at Albany, Aug. 27, to build an electric railroad from East Northport, on the Long Island road to Northport Harbor, 8 miles. The capital stock is $50,000, and the Long Island road is interested, and represented in the directors.

OCILLA, PINEBLOOM & VALDOSTA.—This line, which is now in operation between Lax and Pinebloom, Ga., with connection on the Plant line, is being extended from Bostick to Nashville, Ga., 10 miles, and the extension is projected to Valdosta, 26 miles farther. It is also proposed to build from Lax, 12 miles northwest to Ocilla.

ONTARIO & WAYNE TRACTION.—Incorporated at Albany, Aug. 28, to build an electric line from Canandaigua, Ontario county, New York, to Pultneyville, Wayne County, 30 miles. The capital stock is $500,000, and the directors are John Raines W. L. Parkhurst, J. L. Burnett, and W. H. Knapp, of Canandaigua, and others.

ORANGE & NORTHWESTERN.—Track laying is reported begun on this line in Texas, from Orange, 35 miles northwest, to Buena.

OZARK & CHEROKEE CENTRAL.—Twenty miles are said to be graded and 15 miles laid with 60-lb. steel rail, from Fayetteville to Lincoln, Ark. Location has also been made to Muscogee, Ind. T., by way of Westville, Tahlequah and Fort Gibson.

PITTSBURGH, FORT WAYNE & CHICAGO.—Plans have been approved by the Grade Crossing Committee at Allegheny for raising the tracks of this company through that city.

PUEBLO, GUNNISON & SAN JUAN.—This company was incorporated in Colorado, Sept. 3, with principal office at Ouray, Colo. The capital stock is $100,000, and the annual meeting set for the third Tuesday in November. The route has not yet been announced. The Denver & Rio Grande has a line between Pueblo and Gunnison, and practically covers the San Juan territory with its Durango branch. Among the directors of the new company are Thos. F. Walsh, W. W. Story and George R. Hurlburt.

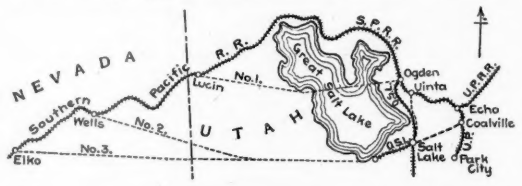
RIO GRANDE WESTERN.—An extension of the Willow Creek branch into the Nine-mile country towards Vernal, Utah, where oil has been found in great quantities, is reported. The Willow Creek branch leaves the main line below Colton, Utah.

SAN PEDRO, LOS ANGELES & SALT LAKE.—Bids were opened at Los Angeles, Sept. 9, for the grading of the 30 miles from Los Angeles to Pomona, and the specifications are being prepared for the grade for the next 30 miles beyond. The surveyors are working eastward from Cajon Pass, on the desert, and about 200 miles remain before a connection will be made with the survey completed from the Utah side to the Nevada-California State line.

SHREVEPORT & RED RIVER VALLEY.—Grading is reported completed on the extension from Alexandria to Mansura, La., 30 miles, and it is said that surveys are being made for an extension south from that point towards the Mississippi River and New Orleans.

SOUTHERN MISSOURI.—It is said that this road will run from Missouri Junction, Ill., to Bismarck, Mo., 40 miles. Surveys are completed and the line is being graded between Missouri Junction and Ozark Summit, 26 miles. (Construction Supplement, March 8, 1901.)

SOUTHERN PACIFIC.—The map shows the various cut-offs projected in the vicinity of Great Salt Lake. Work on the Lucin-Ogden cut-off (No. 1) which was under



consideration before control passed to the Harriman syndicate, was abandoned by the new owners, pending an investigation of the south shore route. The dotted lines on the map do not represent alignment, but suggest, as accurately as it is possible to figure them, the several routes under consideration. It is seen that the Union Pacific reaches a point considerably south of Ogden, and from Ogden the Southern Pacific runs northwest, instead of east and west, as is popularly supposed. Taking Wells and Elko as the two points from which the Salt Lake cut-off (No. 2 and No. 3) could be run, the following result is arrived at:

Wells to Echo.

	Miles.
Existing line via Ogden	259
Cut-off via Salt Lake City, Uinta	230
Cut-off via Salt Lake City, Coalville	208

Elko to Echo.

	Miles.
Existing line via Ogden	316
Cut-off via Salt Lake City, Uinta	267
Cut-off via Salt Lake City and Coalville	245

The trestle cut-off across the Lake would save but 39 miles from Lucin to Echo, whereas the Wells cut-offs save 29 miles by one route and 51 by the other, and it would be possible by building to Elko to save 49 miles on one route and 71 on the other.

SEABOARD AIR LINE.—It is said that a large tract of land has been purchased at Richmond, Va., for deep-water terminals, but that the title is not yet perfect. The shops at Raleigh, N. C., have been abandoned, and the plant has been transferred to Portsmouth, Va.

STILLMORE AIR LINE.—The extension from Swainboro to Wadley, Ga., 19 miles in length, is now completed and it is said that this company has arranged with the Central of Georgia for terminals at Wadley.

TOLEDO & LIMA TRACTION.—This company has been incorporated in Ohio, with a capital stock of $50,000, to build an electric road from Toledo through the counties of Lucas, Wood, Putnam and Allen, to Lima, a total of about 70 miles. The incorporators are: J. D. S. Neely, D. J. Cable, of Lima; A. K. Detwiler, H. A. Tobey and G. G. Metzger, of Toledo.

TWIN CITY, PIERRE & BLACK HILLS.—There is no incorporation under this name (Aug. 30, p. 612), but the present scheme is one to utilize 150 miles of grade which is already built and in shape to be turned over to any company which will put rails on it. The company which built the grade was incorporated in 1886, under the name of the Duluth, Pierre & Black Hills, with a capital stock of $3,000,000. The present board of directors of the new company is composed of C. W. Richardson, L. B. Albright, J. D. Hilger, J. C. Eager, H. R. Horner, C. L. Hyde and C. H. Burke, all of Pierre, S. Dak.

WABASH.—Surveys are reported completed for a new line 10 miles long on the Pittsburgh, Carnegie & Western, to reach the Southside mills, Pittsburgh. The proposed freight branch will connect with the main Pittsburgh extension in Saw Mill Run, back of the Mt. Washington tunnel. A tunnel is to be driven under the Brownsville road, and the line is to continue down Ross Run and Streets Run to the Monongahela. The plans involve the bridging of the latter. The total cost is estimated at $500,000.

Bids were received, Sept. 12, for the grading and masonry of the Pittsburgh, Carnegie & Western and Cross Creek roads, from a point near Bridgeville, in Allegheny County, Pa., to a point on Cross Creek, at or near the Ohio River, in Brook County, W. Va., 28 miles.

RAILROAD NEWS.

ATLANTIC COAST LINE.—This company has bought in $2,500,000 of its 4 per cent. certificates of indebtedness at prices ranging from 96 to 98, with the proceeds from the sale of stock of the Richmond, Fredericksburg & Potomac. It is said that the Atlantic Coast Line will have a fifth interest in the new company formed by the latter in connection with the Pennsylvania, Seaboard Air Line, Chesapeake & Ohio and Southern.

CANADIAN PACIFIC.—At the annual shareholders' meeting, Oct. 2, a resolution is to be considered for the issue of bonds to the extent of £480,000 sterling, to aid in the acquisition of steam vessels and their complement. Another of the "Empress" steamers will be built, it is said, if the issue is authorized, and improvement made in the fleet of the Canadian Pacific Navigation Co.

COLORADO & NORTH WESTERN.—It is said that a controlling interest in this property has been bought by Major Samuel Dick, of Sharon, Pa. The road in question is a 3-ft. gage line projected from Boulder to Ward, Colo., 27 miles; from Gold Hill to Sunset, and thence to Eldora, Colo., 19 miles, and from Eldora to Middle Park, Colo., 45 miles; total, 91 miles. Up to June 30, 1899, the Boulder-Ward part of the line was completed with a terminal at Boulder, making a total mileage operated of 29 miles.

HOUSTON & TEXAS CENTRAL.—On Aug. 23 the following companies passed under direct control of the above: Central Texas & Northwestern; Fort Worth & New Orleans; Austin & Northwestern, and Granite Mountain & Marble Falls City.

ILLINOIS CENTRAL.—The monthly statement of earnings for July shows gross receipts from traffic of $3,175,752, with 4,265 miles of road operated, as against $2,636,890 gross last year for the same month, with 3,996 miles of road operated, an increase of $538,862 gross receipts and 269 miles of road. The operating expenses and taxes for July, 1901, were $2,206,735, as against $2,237,158 last year, giving an increase in net of $569,285 over the same month last year. The estimated gross receipts from traffic for the month of August are $3,343,434, as against $2,881,721 last year.

KANSAS CITY & NORTHERN CONNECTING—The foreclosure sale, originally set for July, has been postponed until Oct. 12, and will take place at Pattonsburg, Mo. The road was projected to run from Kansas City to Pattonsburg, Mo., 80 miles, and, up to June 30, 1899, was completed between a Chicago, Milwaukee & St. Paul connection, north of the Missouri River bridge, to Pattonsburg, 75 miles, with a 10-mile branch. Total lines operated, including leased trackage, 91 miles. The road went into the hands of a receiver on Jan. 2, 1900.

KANSAS CITY-LEAVENWORTH.—The Leavenworth Electric, Kansas City-Leavenworth, Kensington, Leavenworth & Lansing, and Kansas City & Leavenworth Traction Companies, a total of considerably over 50 miles in operation, combined by permission of the Kansas Charter Board, with the above title. David H. Kimberley is President. It is said that bonds will be issued to complete the line.

MEXICAN INTERNATIONAL.—Speyer & Co. have bought this property, and it is thought that it will be operated in connection with the Mexican National, which is being reorganized by the same firm.

MICHIGAN ROADS.—The earnings for the seven months ending July 31 were $23,202,802; an increase of $1,134,136 over the corresponding period in 1900, which was the greatest year's business heretofore recorded in the history of the state.

MISSOURI, KANSAS & TEXAS.—In accordance with the guarantee of the Booneville R. R. Bridge Co. 1873 bonds, this company will call at par the outstanding issue of $334,000 on Nov. 1. Bondholders who so desire may obtain in exchange new 4 per cent. 50-year gold bonds, guaranteed by the M., K. & T., of an issue of $1,000,000 secured by mortgage on the Bridge Co.'s property, on a basis of par plus interest to Nov. 1 for the old, against 80 for the new, with interest from that date.

NASHVILLE & KNOXVILLE.—It is said that this road has been purchased by Col. Baxter, and the first payment made, to form part of the Tennessee Central. The purchase gives the Tennessee Central full ownership of its road from Nashville to Harriman, 204 miles, when the part now building between Lebanon and Nashville is completed.

NEW YORK CENTRAL & HUDSON RIVER.—The returns for August show gross earnings of $6,795,466, against $5,980,876 last year; an increase of $814,590. To admit of comparison, the Boston & Albany earnings, last year, are included.

RAPID TRANSIT, NEW YORK.—Controller Coler is advertising for bids for $3,000,000 3½ per cent. corporate stock, the principal of which is to be used in payment for the tunnel. The bids will be opened at his office Sept. 16. The principal is payable in 1949.

RIO GRANDE WESTERN.—The Sevier Railway Co. has filed a deed in Utah conveying right of way and roadbed to the Castle Valley. The Sevier operates a line from Manti to Belknap, Utah, 62 miles, which is controlled by the Rio Grande Western, and the property now transferred extends from the town of Salina, Utah, up Salina Canyon 18 miles to Meadow Gulch, 10 miles up the gulch to Salina Pass, and down the other side to a point in Castle Valley, Emery County. The consideration is 500 fully paid shares in the Castle Valley Co.

ST. LAWRENCE & ADIRONDACK.—The sale of $315,000 new stock at par to the shareholders has been authorized to retire the $300,000 debenture 6s which have been called for redemption at 105.

SAVANNAH, FLORIDA & WESTERN.—Sale to this company of the Savannah Wharf & Terminal Co. is reported.

SOUTHERN.—The Western North Carolina branch is advertised for sale in execution of judgment, in a legal dispute between the railroad and the plaintiffs.

SOUTH SHORE.—Seventy-five per cent. of this company's capital stock is now controlled, it is said, by the Webb syndicate, and Arthur L. Meyer has been elected President. The Dominion Securities Co. will provide funds for the proposed Levis extension. It is thought that control of this company may pass to the St. Lawrence & Adirondack management.

TOLEDO, COLUMBUS, SPRINGFIELD & CINCINNATI (ELECTRIC).—The stockholders of the Lima, Lewiston & Bellefontaine (electric) have confirmed the sale of their property to the above-named line. It is said that 110 miles of line will be building within the next three months. The capital stock has been increased from $100,000 to $5,000,000, and an issue of $2,500,000 bonds has been authorized.